Grounded Growth

Rethinking housing for migrant workers in Ahmedabad, India

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Table of Contents

Abstract 7

Part 1

Introduction 10
Problem Background 12
National Context 12
Local Context 14
Problem Statement 16
Relevance 18
Motivation 20
Research Questions 22
Scope 24

Part 2

Methodology and Approach 28
Theoretical Framework 30

Part 3

Research and Analysis 36
Site Analysis: Rajiv Nagar 86
Stakeholders and Financial Framework 118
Design Strategy 125
Urban Scale 127
Cluster Scale 131
Building Scale 135
Dwelling Scale 139
Design results 143

Part 4

Conclusion 283
Reflection 286
References 288
Appendix 295

Abstract

The subject of this thesis emerges from the critical observation of the contemporary Indian landscape. The hands that build the cities have nowhere to sleep. In Ahmedabad, the skyline is in a constant vertical rise, while the people that help build it sleep in its shadows, on pavements or slums. Overall, the economic engine of the city relies on a massive migrant workforce, textile weavers, factory hands, rickshaw pullers, and construction laborers, which suffer constant housing threats. This project, titled “Grounded Growth” is an attempt to bridge the gap between the exclusionary architecture of the city and the kinetic, precarious lives of its workforce. This report represents the final thesys of the graduation project called Global Housing. It is part of the Master architecture at TuDelft.

Part 1
Introduction

Introduction

The urbanization of Ahmedabad is fueled by the “floating” migrant population who face systematic housing exclusion. The migrant worker occupations consist of a large spectrum of settlement typologies based on duration of stay, income and household composition. The occupations can have different shapes, from sleeping on pavements or under bridges, to informal rental arrangements in slums, employer-provided dormitories to peripheral resettlement colonies (Mahadevia et al., 2014; Desai et al., 2018). Contemporary housing in India provides housing models prioritizing stable income, access to documentation and to credit. These housing models systematically exclude circular migrant workers, forcing them to rely on informal housing options (Mahadevia et al., 2014). Even when the state acknowledges the problem and relocates informal settlements into formal housing, it actually exacerbetes the issues, relocating them at the periphery of the cities leading to more social and economical problems (Desai & Mahadevia, 2012; Desai et al., 2015).
This thesis proposes a high-density, mixed height and income model, that addresses the variety of migrants and their diverse household compositions. This project separates the “structure”, built by developers, from the “infill”, built by the residents. The strategy of this design proposal is based around a “Seed Unit”, a structural core that contains the main components needed in a home, sanitation, shelter. However, the “Seed Unit” counts on the resident’s care and vocational skills, to grow and flourish. The foundation of this concept relies on “Shraam Daan”, which means gift of labor, providing the opportunity for the migrants to utilize their own labor in exchange for affordable accommodation. Moreover, by using a mixed income, cross subsidization model, the housing project manages to achieve affordable housing for the economically weaker sections by selling the dwellings at construction costs and with long term installment payments. This project wants to achieve a housing “ecosystem”, that provides safety, dignity and shelter to its residents, proving that housing can be a form of “Grounded Growth”, rooted in the earth and nurtured by the users (Turner, 1976).



(News18, 2018)

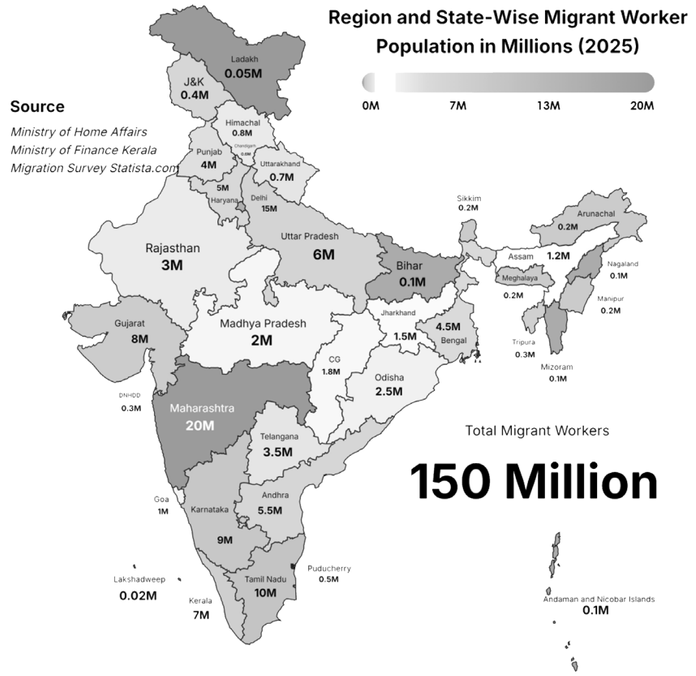
Problem background

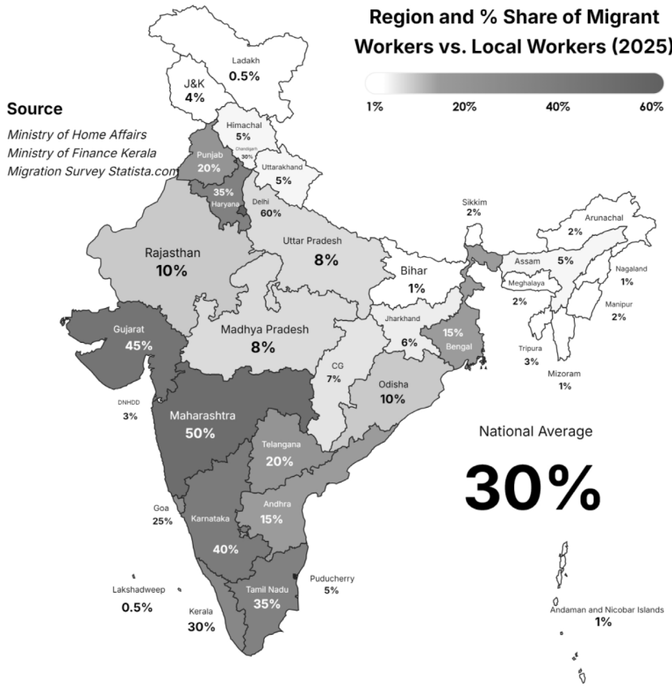
National context

The nation has close to 150 million migrant workers which constitutes approximately 30% of its total 500 million workforce (India Data Map, 2025). The importance of migrant workers lies in their contribution to the economic development of India through their employment in industries such as construction, manufacturing, transport, household activities, fishing, textiles, and others (India Data Map, 2025).

Economically developed states like Maharashtra, Gujarat, Delhi, Karnataka, Kerala, and Tamil Nadu depend upon the labor force available from migration to meet their needs for urbanization and industrialization. In Gujarat, migrant workers make up 45% of the total workforce of the state (India Data Map, 2025).

Although they contribute economically, migrants are some of the most vulnerable groups in the country. On a national scale, the migrant worker system is largely associated with the country's massive informal sector. According to the International Labour Organization, informal work prevails among the Indian workforce, which leads to insecure employment opportunities, meager earnings, and lack of safety and social protection measures (ILO, 2020). Many migrant workers have no contracts or health care facilities, do not get pension plans, do not have insurance, and have limited legal rights. Inequality in wage distribution is yet another problem that affects migrants because they earn significantly less compared to locals who do the same work (India Data Map, 2025).





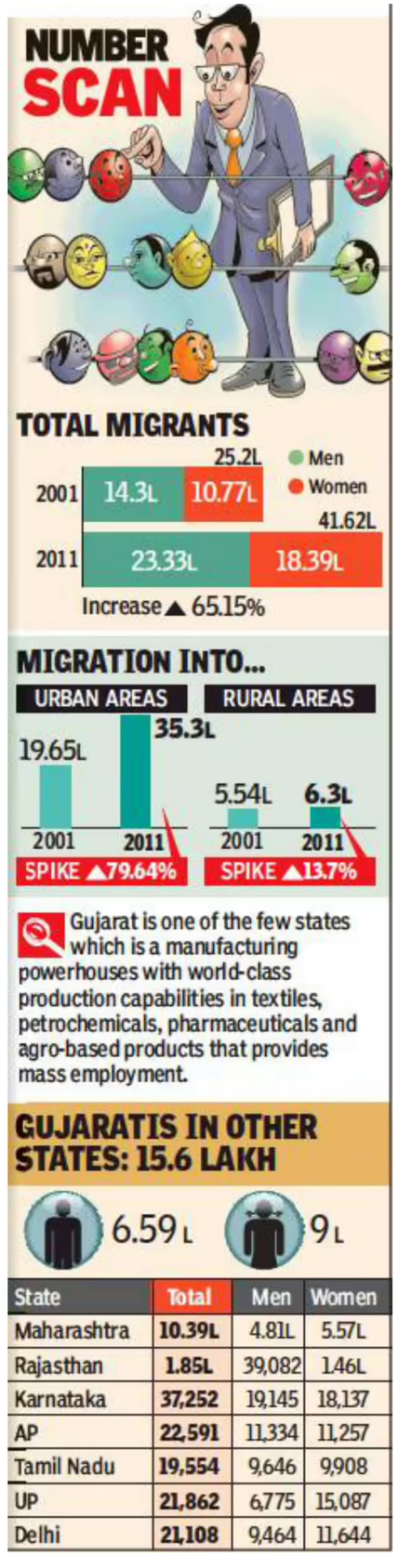
(India Data Map, 2025)

Problem background

Local context

Due to the nature of its economy, which includes industries, construction, textile production, transport logistics, and developing urban infrastructure, Ahmedabad has traditionally received a significant influx of migrant workers. The city serves as an important location for migrants who arrive seasonally and move between areas, coming from economically distressed parts of Gujarat, Rajasthan, Madhya Pradesh, Uttar Pradesh, Bihar, and Odisha, where there is scarcity of jobs and farmers have been struggling to earn their livelihoods (India Data Map, 2025; Desai, 2024).

The issue is exacerbated by Ahmedabad's urbanization and high costs of land, which render formal housing unattainable for poor people in the area. Informal housing is found to be a product of structural discrimination, social inequality, and the incapacity of formal planning systems to provide suitable housing to the economically weaker sections (Marnane & Greenop, 2023). Hence, migrant workers often resort to constructing ore renting informal housing as a coping strategy even if they have insecure tenure and lack access to basic facilities (Marnane & Greenop, 2023).



State	Total	Men	Women
Maharashtra	**10.39L**	4.81L	5.57L
Rajasthan	**1.85L**	39,082	1.46L
Karnataka	**37,252**	19,145	18,137
AP	**22,591**	11,334	11,257
Tamil Nadu	**19,554**	9,646	9,908
UP	**21,862**	6,775	15,087
Delhi	**21,108**	9,464	11,644

(Paul John / TNN / Updated: Jul 30)

Problem statement

Migrant workers are primary agents of the urban economy but they are constantly overlooked and remain marginalized victims. Thousands of workers migrate seasonally from rural villages to work in the city (Mahadevia et al., 2014).
The city treats them as “invisible” residents, lacking stable income, voting rights and even identity proof. The existing housing stock constantly fails them.
Firstly, it often happens that the government relocates slum communities, which migrants are often part of, into formal housing on the city’s outskirts. A study shows that some of the evicted households were moved into 4 stories buildings at 32 different locations, part of BPSUP colonies, far away from their original location (Desai, Sanghvi, & Abhilaasha, 2018). However, the relocation created a disruption in the work and income of the families. This approach was described as “structural violence” due to the distance to their workplaces, spending much more on transportation and often losing work (SabrangIndia, 2017). Furthermore, reports show unsafe conditions for women and children at the relocated sites.
At Vatva resettlement, there were reports of violence, harassment, theft and sexual assault due to the loss of informal street surveillance, Also, it was noticed that families ended up having higher expenses due to water and power costs, limiting their budget even more (Sabrangindia, 2017).
Secondly, formal affordable housing models in India are ownership oriented.
There are programs such as the Pradhan Mantri Awas Yojana (PMAY), which require capital contribution, documentation or long-term stability, something that migrant workers do not have access to, considering they earn daily-wages.
This system forces them to live on pavements, under bridges or into informal settlements, where they pay rent to a slumlord, which leaves them with almost no security (Mahadevia et al., 2014).
Lastly, a highly overlooked aspect is the missed opportunity to create a “Housing ecosystem”. Even though not all migrant workers are masons, the collective community has the skill to build, which can be leveraged into a highly desirable asset. The current market proposes finished housing, which ends up being too expensive, too far from their workplace and unsafe, ignoring the specific needs of each different migrant typology, and denies them the opportunity to build for themselves and expand based on their needs, ignoring the “labor” the community possesses.


(Desai, 2026)



(Paliath, 2024)

Relevance

There are 1.3 - 1.7 million migrant workers estimated in Ahmedabad, which is roughly half of the city's workforce. Approximately, 5 lakhs are out-of-state migrants, coming from Udaipur, Bihar, Rajasthan etc. and underpin Gujarat's industries (World Economic Forum, 2017; Shastri, 2018). Most migrants can't afford formal housing and lack proper documentation making them invisible" in city planning. The lack of affordable migrant housing in Ahmedabad reflects a much larger problem. Overall, India is facing a housing shortage due to rapid migration, there is estimated to be a shortage of 31 million houses by 2030 (Mittal et al., 2025).

Governmental programs, such as PMAY, have largely focused on ownership models and the redevelopment of slums, leaving a large gap in housing for migrants (Desai, 2015). However, after 2020, policy became more rental oriented, with initiatives like Affordable Rental Housing Complexes (AHRC). Despite this, the measures are too limited, the national rental housing program projected to create 88000 new units across all cities, which is far too low considering the demand (Naik, 2021).

Considering the scale of the problem, a high-density housing model for migrants is needed urgently. Hence, a housing model where the skills of the workers is leveraged to their advantage, and can balance the disadvantage of low earnings and unstable incomes, can be the solution for this problem. Creating a housing model where the developer constructs a structure with wet cores", creating a so called seed unit, basically providing the essential services, but also allowing for the opportunity of expansion of each unit the infill", by the residents can reduce costs and improve quality. The free choice of each resident to adapt their space based on their needs, while having basic sanitation and safety from the beginning would significantly improve the quality of life and would evetually allow the permanent migrants to grow roots in the



author's image, 2024)

Motivation

The motivation of this project comes from the belief that architecture can be a process, not a product. Considering all migrant typologies, a high-density housing model that allows for different household compositions, but also different resident temporalities is something that needs to be addressed, otherwise the housing model would not be suitable for migrant communities. The people that contribute vastly to the growth of the city live in unstable, unsafe and informal conditions. Existing housing policies either exclude this group or relocate them into already developed buildings that are too far and do not support their needs.
Rental based policies are not enough to support the vast flux of people.
This project aims to create a high-density housing model that responds to economic situations, mobility and the diverse household structures. It aims to challenge the ownership-based and relocation approaches by proposing a, flexible system that combines developer-built structures with resident infill construction. By separating the permanent infrastructure from adaptable living spaces, it seeks to create affordable housing, while maintaining the dignity of the migrant workers. The goal is to prove that architecture can act as an enabling framework, integrating migrants into the urban fabric.

Research questions

How can **high-density** housing adapt to the changing lives of **migrant workers** while supporting **social connections, livelihoods, and a sense of dignity**?

What architectural and urban strategies distinguish socially resilient high-density housing precedents from projects that have produced isolation and spatial exclusion?

How do varying temporalities of urban migration dictate the distinct spatial requirements and social dependencies of migrant workers? ?

How can spatial hierarchies and shared public spaces foster social interaction, informal economic activity, and integration between different income groups in dense housing environments?

Scope

The scope of this thesis is limited to migrant workers in Ahmedabad. It targets all migrants, whether they are employed in construction, manufacturing, transport or informal sectors.

Moreover, this thesis focuses directly on the typology variation based on migration temporality, household compositions and gender.

The project explores a prototype-based design, focusing on a high-density model. Even though the economic, social and policy factors strongly influence design, the main emphasis remains on architecture. Spatial organization, structural strategy and adaptability are the main considerations when developing the design. The project focuses on the Rajiv Nagar plot, located in South-West Ahmedabad.



(UNSW Sydney, n.d.)



(Singh et al., 2017)



(Karuna, n.d.)

Part 2
Approach

Part 2
2.1 Methods

Field trip

A two-week field trip was conducted to get a better understanding of the target population and surroundings. During this trip, multiple site visits were done to determine boundaries, accessibility, constraints and current issues. Moreover, due to language barriers, some of the current inhabitants were asked to draw their ideal living situations. Their current way of living was documented through sketches and photographs. Permission was asked before taking any photos.

Sketching

During our field trip, an exercise of mapping the site was conducted to get a better grasp of the environment and living conditions. During this exercise, documented sketches were made as well as interviews, to create an accurate map. Interviews were done with the help of CEPT students, however the verbal communication was limited due to a language barrier between the inhabitants and the students. Therefore, visual observations were the most helpful way of understanding the situation.

Stakeholders and financial mapping

Along with the spatial approach, the research will involve stakeholder mapping and financial mapping. This is meant to analyze which stakeholders participate in the process of housing supply and what relations they maintain. The focus of the discussion will be made on the financial processes underlying the issue of housing availability. Alternative development models like long-term land leases and cross-subsidy schemes, will be considered to evaluate their applicability and efficiency. The objective of this part of the study is to discuss the economic side of the matter and explore new possibilities for providing migrants with proper accommodation.

Literature review

A literature review provides both contextual and theoretical grounding for the research. Academic sources and policy reports are used to understand migrant typologies, mobility patterns, and the limitations of existing housing models in India. This includes an examination of relocation housing and its social and spatial consequences.
The review also establishes the theoretical framework through concepts such as incremental housing, user participation, and the support–infill approach. These theories inform the interpretation of fieldwork findings and guide the development of spatial strategies within the design process.

Research by design

In addition to the spatial approach, the study involves stakeholder and financial mapping. In this step, the main stakeholders who take part in the provision of housing are determined, namely landowners, developers, government organizations, and migrant communities. The interconnections between these stakeholders are analyzed, along with the financial processes that influence housing availability.

Case studies

Multiple case studies have been analyzed to assess characteristics needed to support the theories formed. The case studies revealed insights into existing projects and whether their approach was a success or not.

Theoretical Framework

Migrant typologies shape housing needs

This theory argues that migration is constantly changing and cannot be addressed through a single, standardized housing model. Instead, high-density housing should provide different types of living spaces that respond to how long migrant workers stay in the city, ranging from temporary accommodation for seasonal workers to more permanent housing for long-term residents.

When housing does not respond to these changing conditions, a mismatch occurs. Temporary workers may be forced into rigid long-term housing, while permanent residents may remain trapped in unstable and temporary living conditions. For this reason, housing should be designed according to different durations of stay.

The theory also argues that different migrant groups should not be separated into isolated parts of the city. Instead, temporary and permanent housing types should exist together within one integrated residential framework. By combining hostels, shared accommodation, and family housing within the same development, high-density housing can support a wider range of migrant populations while creating a more inclusive and connected community.



(author's image created using AI, 2026)

The fifth elevation

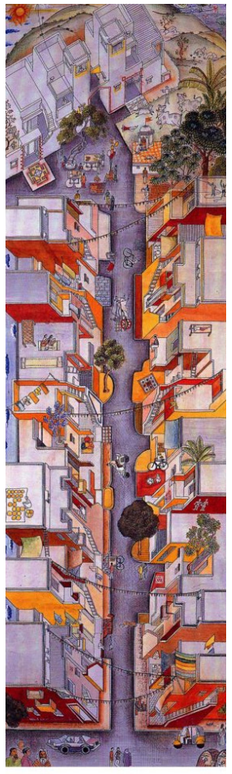
This theory states that in extremely crowded cities, the ground level often cannot provide the social needs to everyday activities because of why, and/or why. Which is why the roof, the 'fifth elevation', should be incorporated into housing as an active social space rather than a mere architectural cover.

Particularly for migrant communities who often have inadequate indoor space to perform daily activities the dwelling is only the starting point, if not the ending point, of where life takes place. Activities extend to the roof of the building, where cooking, relaxation, socialization, and heat relief can be obtained.

Designing rooftops as housing spaces recognizes the need for informal social spaces that exist in the dense housing that is characteristic of informal settlements. Creating social spaces on the roof of buildings improves the quality of life in high density housing.



(Donyanedomam, 2011)



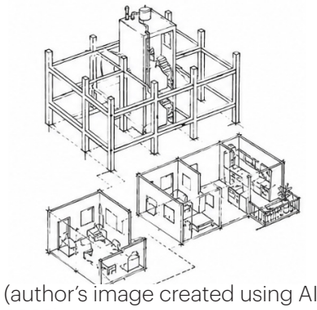
(Architexturez, n.d.)

Mixed Socio-Spatial Hierarchy

This theory suggests that high-density housing fails when it divides low-income populations into isolated and uniform housing blocks. This disconnects communities with the city and its economic, social and public systems, which results in segregation and exclusion. Good housing should create social and economic integration by including diverse income groups in a common urban setting.

This theory suggests a hybrid urban form in preference to a uniform isolated form. In many BSUP housing projects, repetition and uniformity in design of high-rise housing blocks monopolized high density by disconnecting residents from the urban social and economic systems. On the other hand, Aranya Low Cost Housing formed a more integrated structure by clustering diverse types of houses around streets, courtyards and public spaces.

Lower income and migrant housing residents were placed around shaded pedestrian courtyards that encouraged informal activities and social contact, while the larger houses were positioned along the wider streets. Even though residents were housed in different physical and social conditions, and were incorporated to different systems, the design of the markets, streets and public spaces promoted interaction and contact on a daily basis. Further, diversity in lifestyles and levels of privacy were accommodated and incorporated.



(author's image created using AI, 2026)

Sense of ownership

This theory explains that people develop a stronger sense of belonging when they have ownership and control over their living space. We can recognize a dignified living space not just in the structures that surround them, but in the residents' assurance of secure and flexible tenure, allowing them to revise constructions over time. The security residents feel in their homes affects the way they perceive the city. They can strengthen their relationship with its structures and transfer the perception from temporary and uncertain to permanent and secure.

This is the view of the Aranya Low Costs Housing. The project laid the foundation of a settler's core with services and the plot and framework of a house, letting the residents obtain ownership, a core of a home, and the right to expand and construct other services on the framework according to their financial and social needs. It communicated that ownership is a form of construction and of responsibility, belonging, and connection to the community for the long term.

Standardization creates spatial alienation

The theory states that high-density housing can, at best, become a poor housing option when the housing unit design is based on a model that, by nature, is repetitive and standard. Many top-down housing projects at a mega-scale tend to ignore socio-economic relationships and only focus on maximizing the number of housing units on a site. Placing individuals and families into rigid and standard housing units not only results in the breakdown of community relationships, but also leads to social isolation and lack of support.

This is the scenario that is seen in the case of Basic Services to the Urban Poor (BSUP) resettlement colonies. Many of the residents who occupied dynamically informal settlements ended up in repetitive housing systems consisting of similar apartment units, narrow corridors, and virtually no adaptable or shared spaces. These projects, although they did provide a basic level of infrastructure and sanitation, did nothing to boost social interaction or allow residents to modify their space for fit their needs.

The BSUP housing model shows that just providing housing is not enough. High-density housing that lacks flexible, shared, and social spaces, as well as residents' control of their space, can create alienation instead of community.

The resident as its own spatial producer

This approach views residents as active participants who create and shape their own living environments. Rather than fully designed homes, housing should provide a basic structural framework flexible enough for residents to modify and shape according to their needs.

There are two main components of the approach:

The supportive framework (of N.J. Habraken's Open Building theory) establishes a permanent structure for the building. It includes the building's structural framework, circulation, and service cores. This provides secure and shared infrastructure for the high-density housing.

The open infill (of John F.C. Turner's housing as a process) allows residents the freedom to design and modify their interiors. This includes the ability to partition, add-on, or change the space to meet their needs over time.

By combining these two parts, building becomes a participatory process, allowing residents to actively shape and modify their housing.

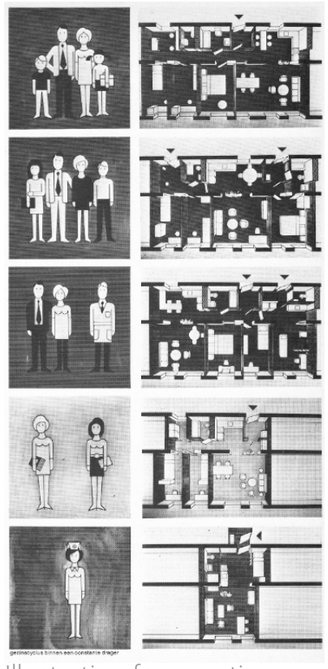
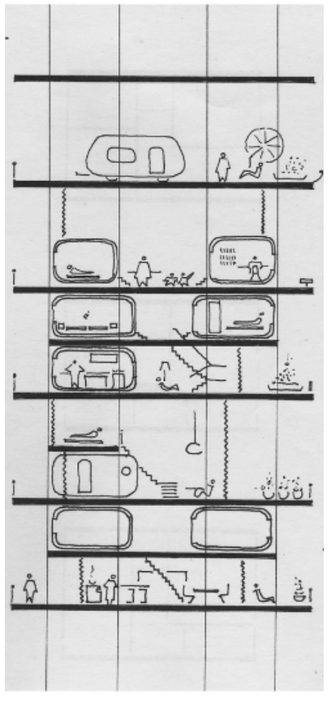
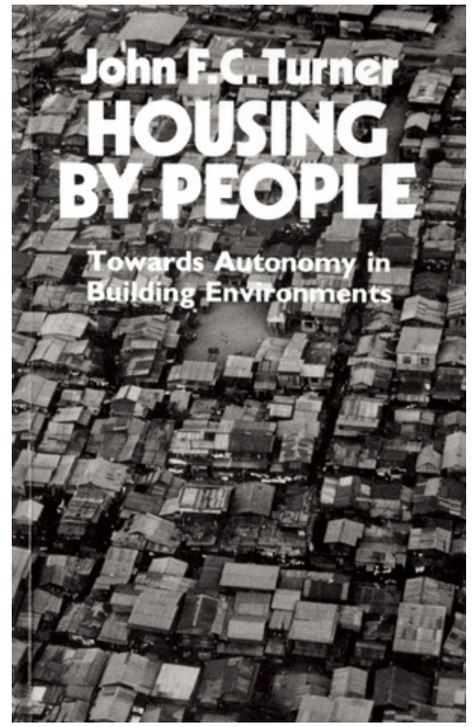


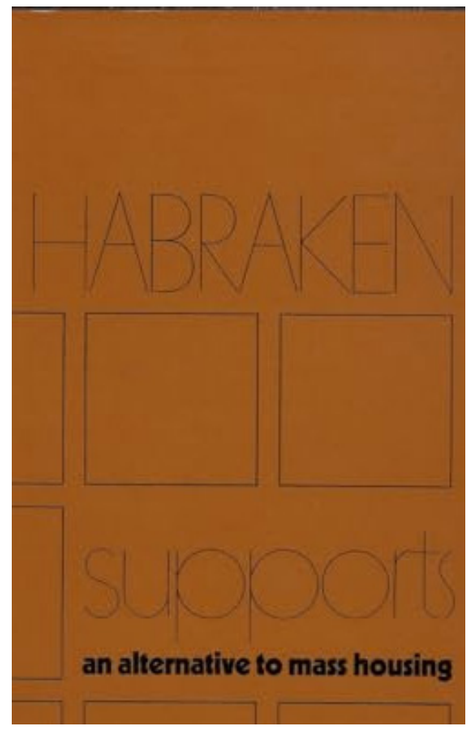
Illustration for an article by the SAR in the journal Plan



Dwellings inserted like 'caravans' in a support, 1963



John F. Turner, 1976



John Habraken, 1961

Part 3
Results

Migrant workers

The migrant worker life in Ahmedabad would be better understood when one sees the invisible force that makes this fast-developing economic center run efficiently. Most of the developing infrastructure, real estate sector, and other industries like textiles in Ahmedabad depend highly on circular migration where workers travel regularly between their rural settlements and the urban area (Desai, 2025).

The typical life of a migrant starts with early morning pick-ups from chowks in the city, which are road-side labor recruitment centers, or through the system where mukadam (contractors) hires directly workers from tribes. Such a life is characterized by a lot of financial insecurity since daily-wage earners cannot earn money if they miss out on their morning pick-ups. The laborers who build the skyscrapers in Ahmedabad stay in extremely poor living conditions where they might sleep on the streets or live in makeshift tarpaulin structures without basic sanitation facilities (Desai, 2025).

Migrant families are increasingly deciding to settle down in Ahmedabad, as they believe in a better tomorrow for themselves as well as for their children. However, the problem for these group lies in the fact that moving from being circular to long-term residents is not easy at all, as they will find it difficult to acquire proper housing facilities within the city, leading to settlement in dense, informal urban areas (Marnane & Greenop, 2023).

For these migrant families, settling in the city brings both opportunities as well as challenges. The reason why families want to settle in the city is that they find the prospects of earning money more promising than in rural parts. Moreover, often children are not able to attend school because of lack of documentation. In addition, women working in the city have to perform physical labor work alongside taking care of the household responsibilities (Desai et al., 2020).



(Reuters, 2020)



Mohammad Salim Hasmi
Sewing worker | 32

"Ahmedabad is a slum"
"Informal activies have become our support to live in the city which is also weak compared to formal activies"
"The city is looking for quantity and not quality"

(Desai & Cornago Bonal, 2020)

Interview with a sewing worker

Published in Ahmedabad Cross Section

Desai, J. & Cornago Bonal, 2020

"Ahmedabad is a slum"

This is a stark critique of the living conditions and urban infrastructure he experiences. It highlights that the rapid growth of the city has left many working-class individuals living in deeply substandard, precarious environments.

"Informal activities have become our support to live in the city which is also weak compared to formal activities"

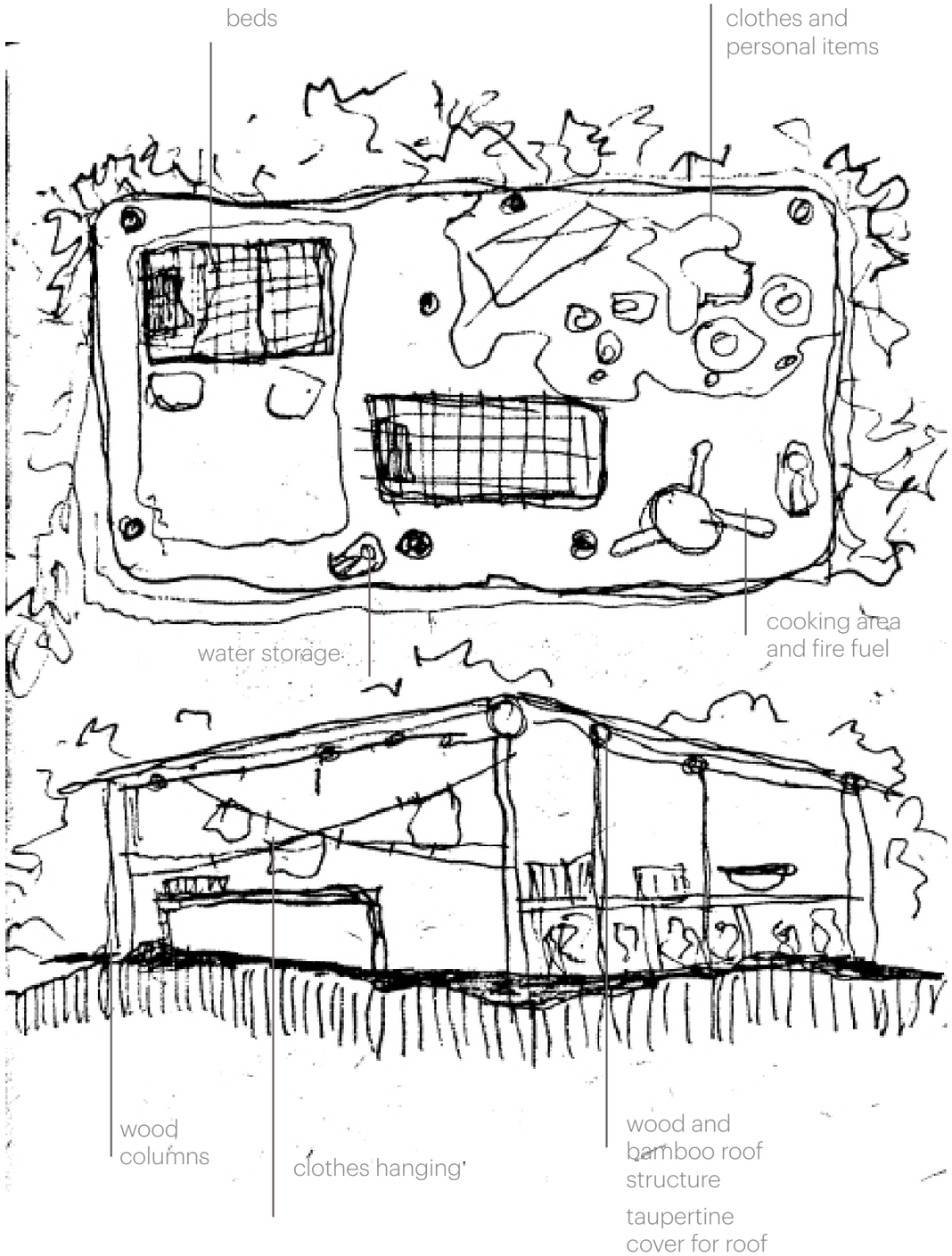
Because stable, formal jobs with social safety nets are out of reach, he and others must rely on the informal economy (like unorganized sewing work) to survive. However, he recognizes that this informal safety net is incredibly "weak"—meaning it offers low pay, no job security, and minimal protection compared to formal employment.

"The city is looking for quantity and not quality"

This speaks directly to how the urban economy values its workforce. He feels that Ahmedabad's industries prioritize mass, cheap labor output ("quantity") over fair wages, craftsmanship, and the well-being or dignity of the workers ("quality").

Living conditions

On the side of streets



(author's image adapted based on Desai et al., 2014)



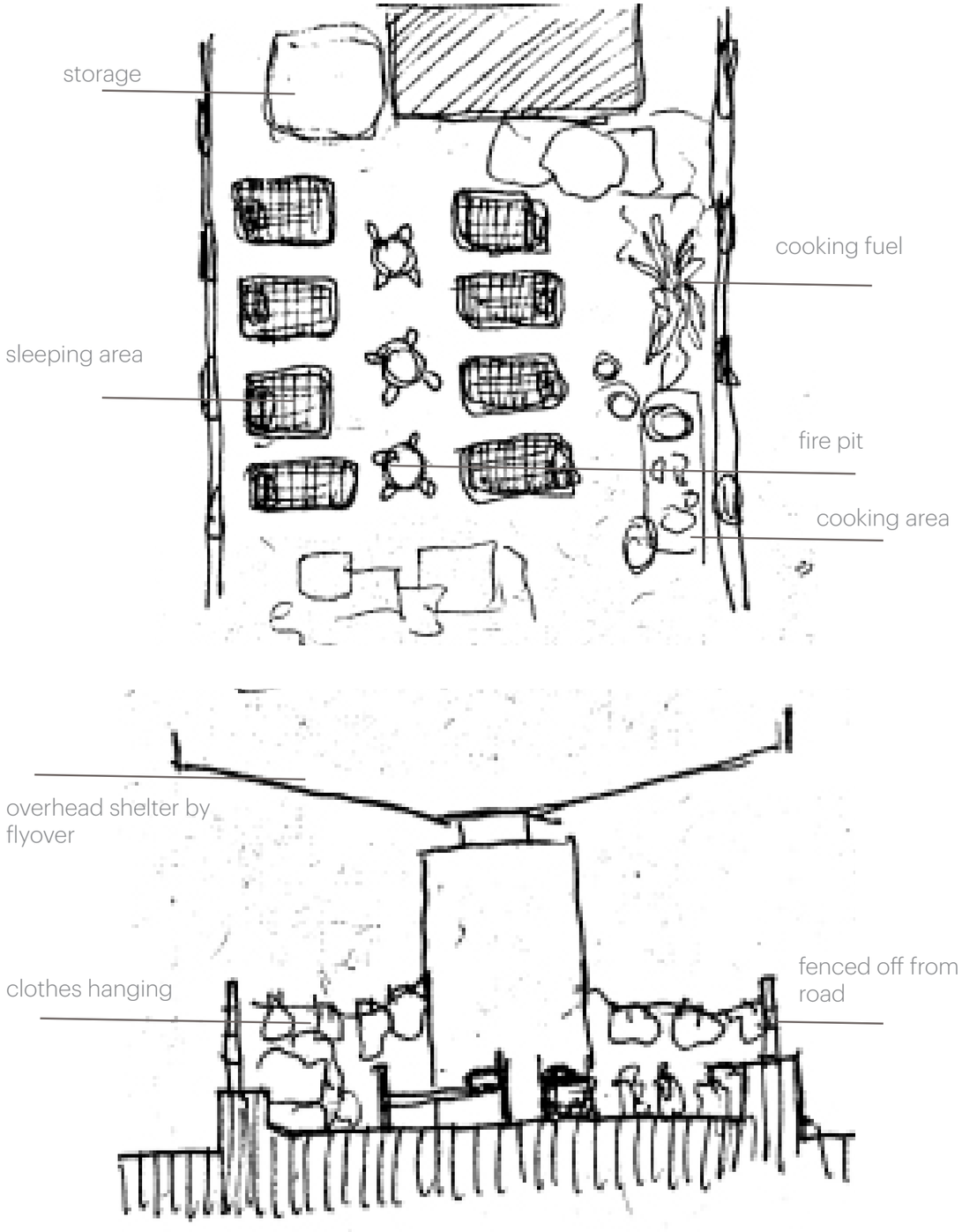
(Desai et. al, 2014, image enhanced using AI)



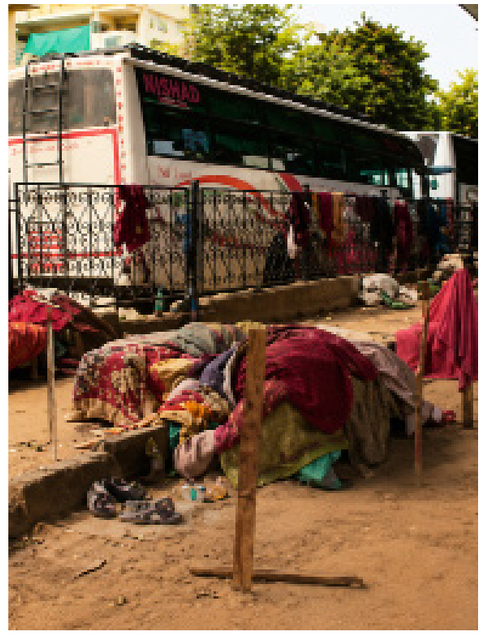
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Living conditions

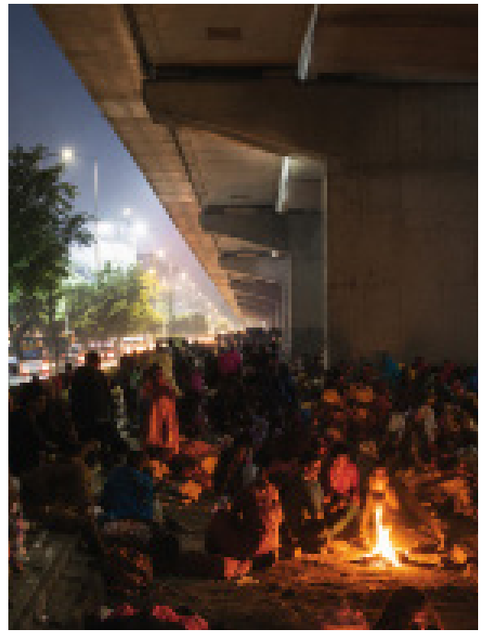
Under flyovers



(author's image adapted based on Desai et al., 2014)



(Desai et. al, 2014, image enhanced using AI)



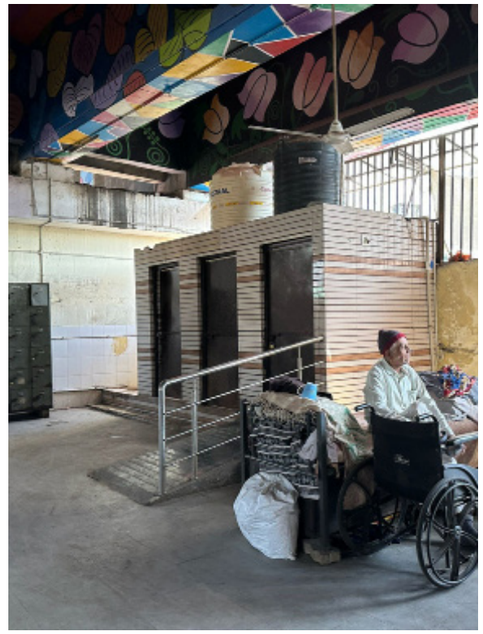
(Desai et. al, 2014, image enhanced using AI)

Living conditions

Nightshelter



(author's image, 2026)



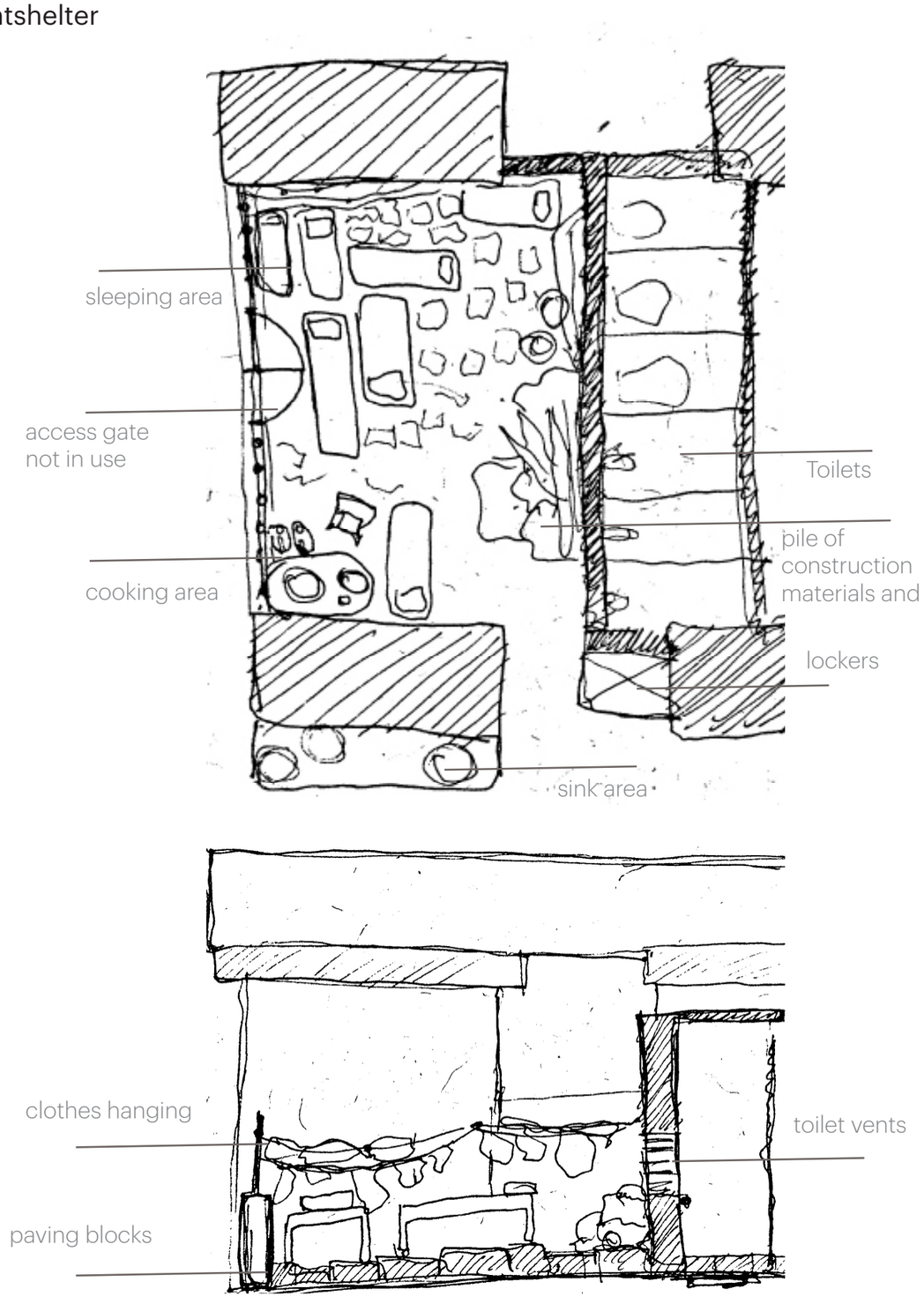
(author's image, 2025)



(author's image, 2025)

Living conditions

Nightshelter



(author's image, 2026)



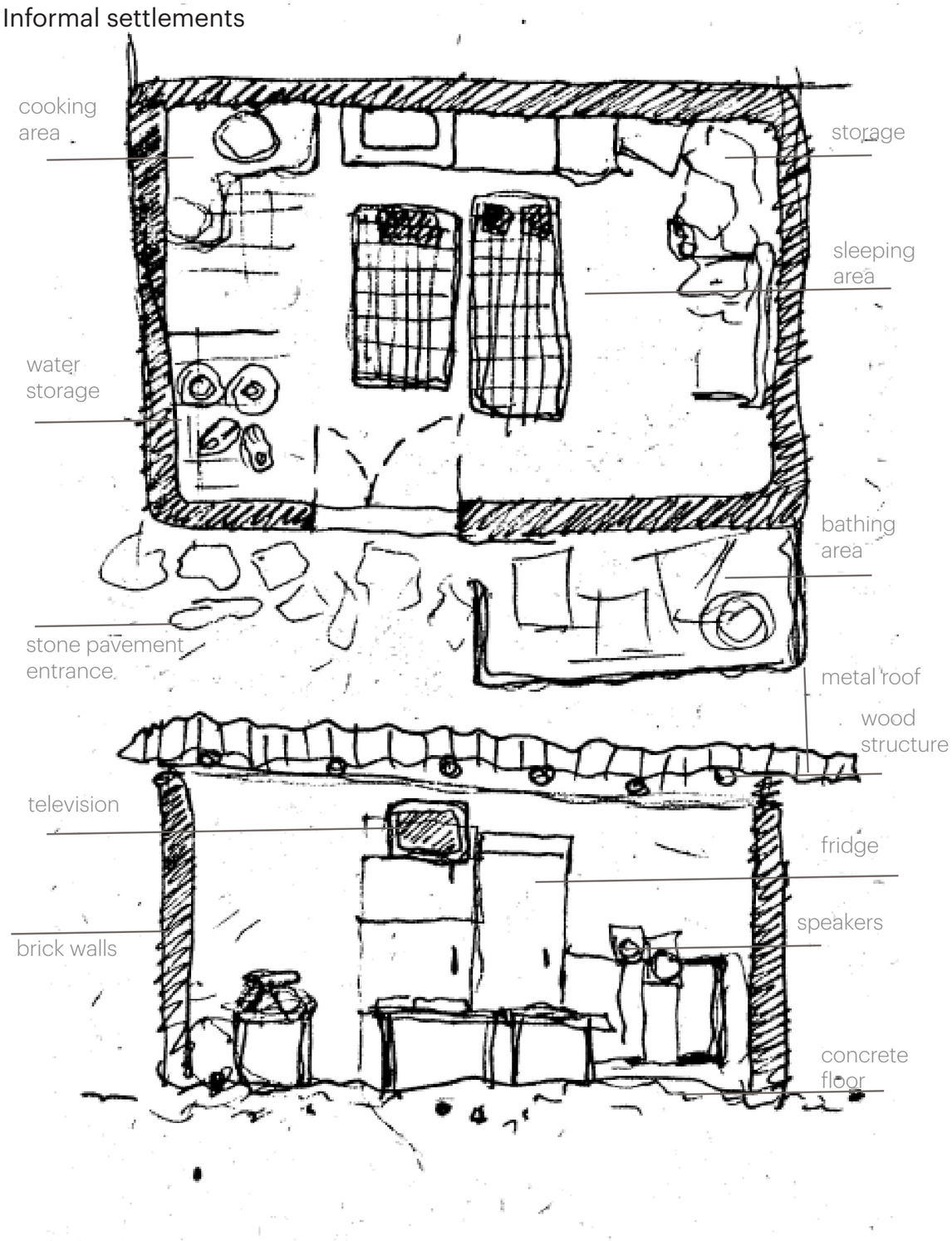
(author's image, 2026)



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Living conditions

Informal settlements



(author's image, 2026)



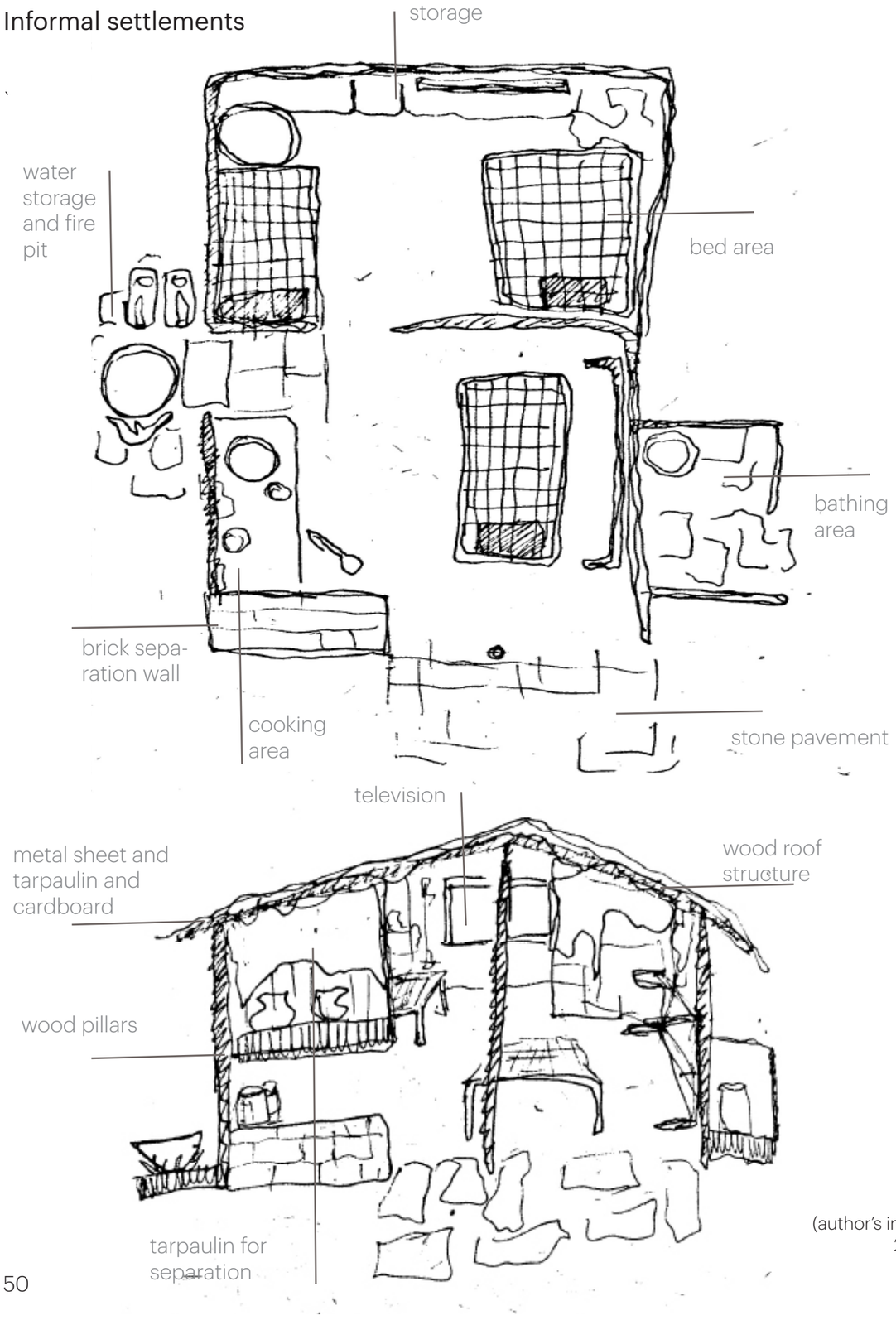
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Living conditions

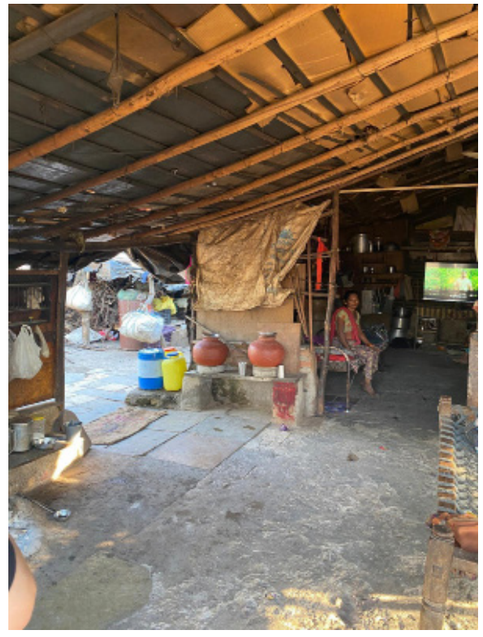
Informal settlements



(author's image, 2026)



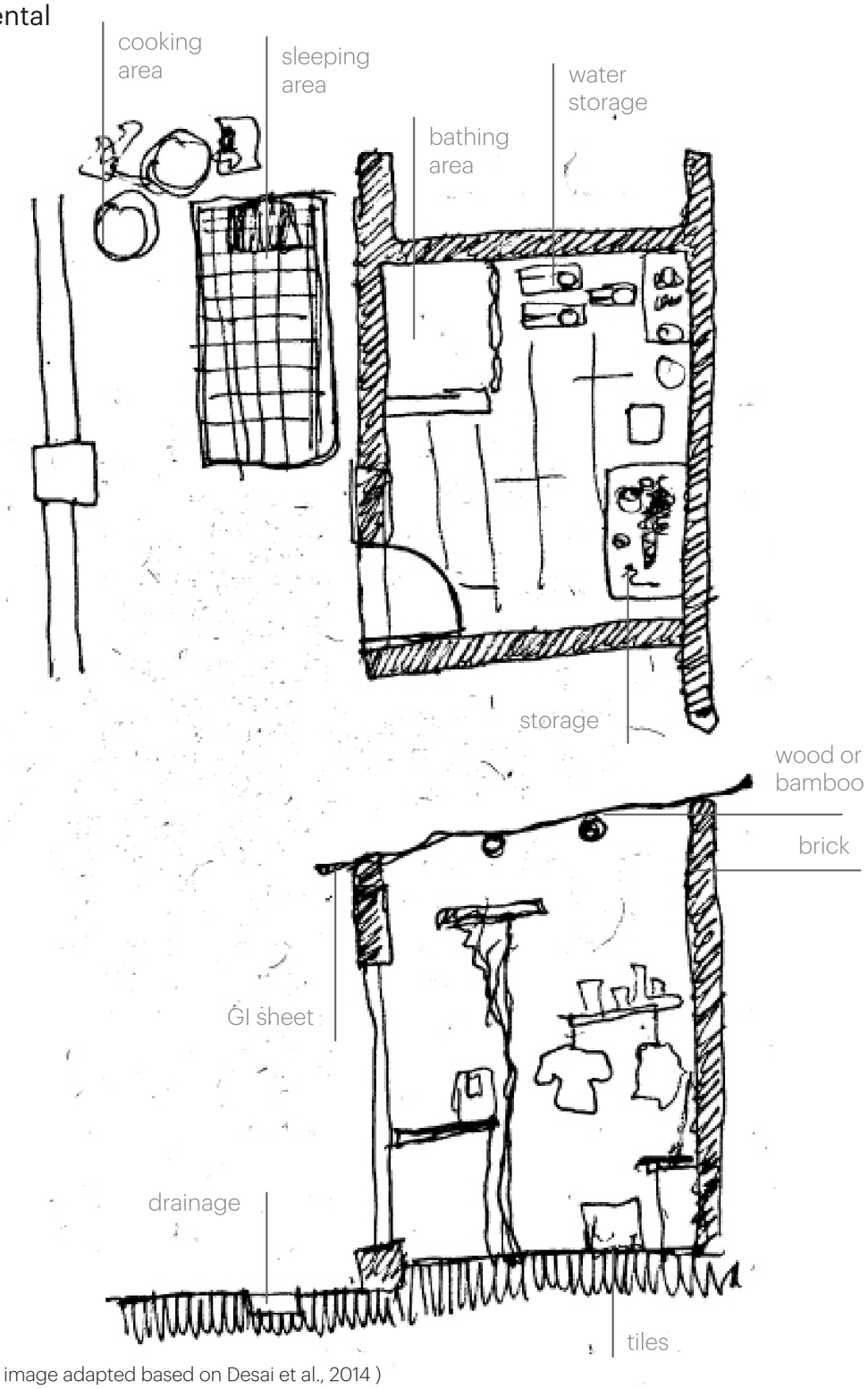
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(author's image, 2026)

Living conditions

Chali rental



(author's image adapted based on Desai et al., 2014)

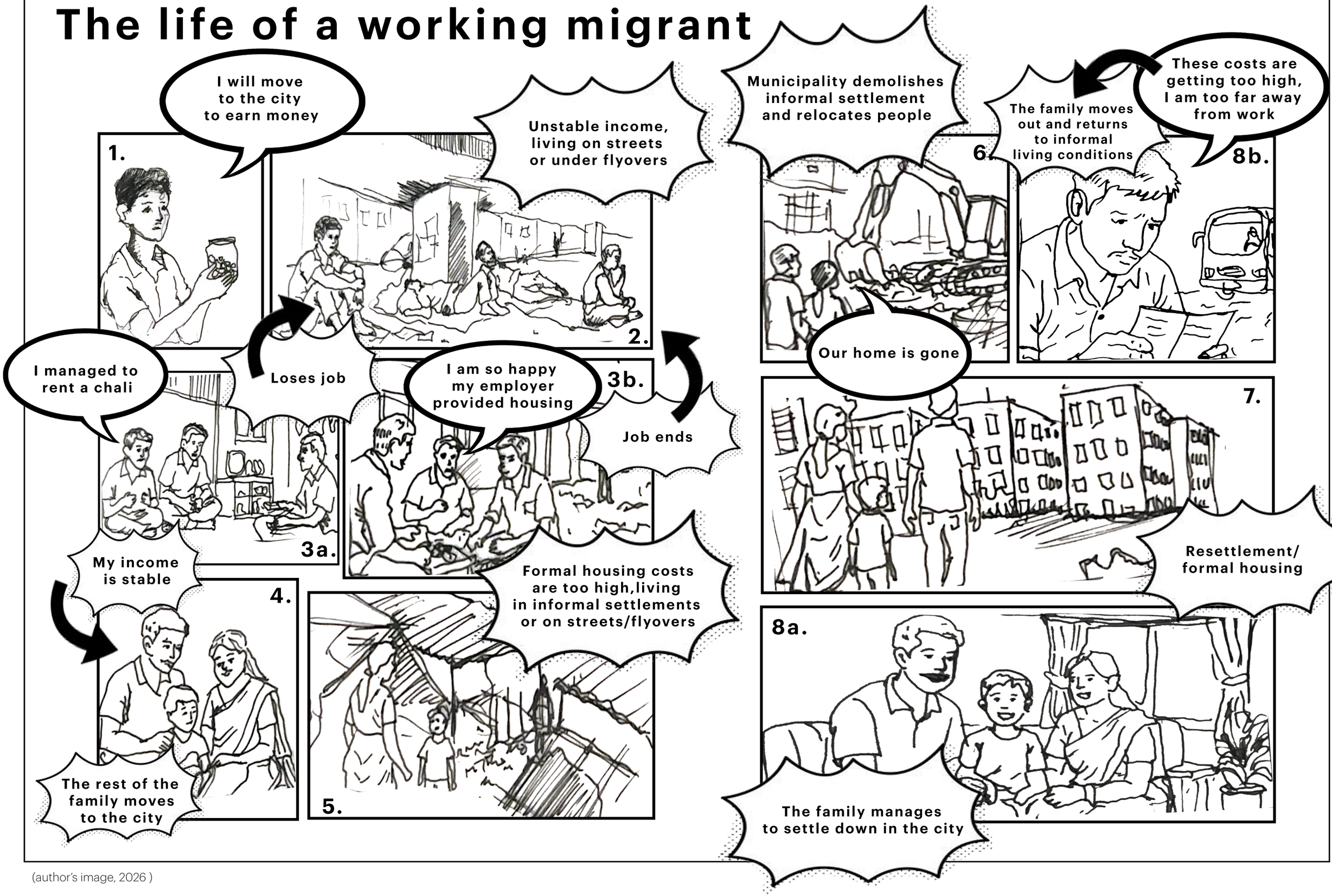


(Desai et. al, 2014, image enhanced using AI)



(Desai et. al, 2014, image enhanced using AI)

The life of a working migrant



(author's image, 2026)

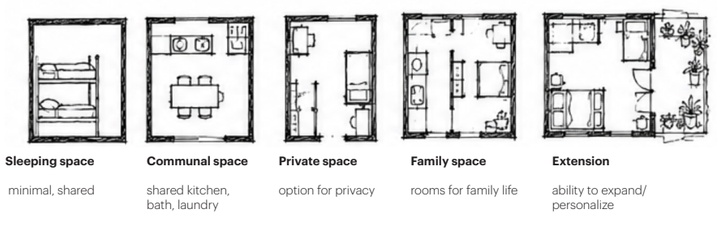
Migrant typologies

Lessons learned

A core finding is that “migrants” function as multiple mobility regimes, not a single population segment. Moreover, urban policy and labor regimes structure “where and how” migrants can live. Hence, what is feasible for a household that expects to leave after a season differs from what is feasible for a household seeking durable urban settlement (SabrangIndia, 2017).

Circular migrants represent the most mobile group, moving based on their job. Therefore, their living space needs to be interpreted through the lenses of mobility, governance and labor organization. In the construction sector, the recruitment through contractors or labor intermediaries dictates both job access and housing security. Seasonal migrants periodically return to their villages, for festivals or harvesting. Seasonal migrants tend to be bachelors, they usually come alone to the city for work, or they can be single women that also are looking for jobs, but they travel in groups for safety. Long-term or settling migrants are migrant families that wish to remain in the city. They are subject to relocation and long term residence in BSUP sites for example. This category’s housing possibilities is strongly shaped by financial constraints, governance burdens and service reliability rather than immediate shelter access.





(author’s image made using AI, 2026)

Typology	Mobility pattern	Typical household form	Common housing	Main constraints	Design
Long-term/ settling	Lower mobility, consolidation over time	Family households	Informal settlement/ formal allocation or resettlement	Location-to-work, recurring costs, governance, Issues with formal housing	Expandable unit, stable services, nearby schools/ health, predictable costs
Seasonal migrants	Over 60 days stay	Single men or group women for safety	Squatter/ homeless sites or informal rentals	high vulnerability to eviction/ harassment	Low-threshold entry, shared service cores, dorm/ rooming flexibility
Circular migrants	High mobility, job-linked moves	Often single workers or crews	Worksite or employer-linked shelter; short-term rentals	Dependence on	Near-work siting, rapid-entry shelter, safe storage and sanitation

Housing initiatives

Basic services programme

Environmental Improvement of Urban Slums (EIUS)/Slum Improvement Programme (SIP)

Early strategies that focused on improving slums physically using standard packages of amenities ,for instance, water taps, storm-water drainage system, community baths (Mahadevia et al., 2014).

Basic services for the urban poor (BSUP)

Changed the paradigm towards a more holistic approach. The focus was on slum improvement, in-situ upgradation and only when necessary, **relocation** (Mahadevia et al., 2014).

Slum Networking Programme (SNP)

This is a participatory model of slum development where different social organizations, private sectors, municipalities, and NGOs come together for providing water, sanitary toilets, street paving, and social facilities (Mahadevia et al., 2014)

Shelter-cum-Services Programmes

Sites and Services (S&S) Schemes

This process was heavily supported by the World Bank, which offered several plot sizes of land for different income groups within Economically Weaker Sections (EWS), through market mechanisms and decentralization, as opposed to construction directly by the government (Mahadevia et al., 2014)

Slum Upgradation Programme (SUP)

An approach that not only provided shelter but basic facilities as well, using two kinds of land tenure strategies. The first one was granting of pattas (land titles) on a freehold basis to individual families. The second strategy was granting of land on a collective basis to the community (Mahadevia et al., 2014)

	FOCUS	IN/OUT OF SCOPE
EIUS/ SIP	It strictly focuses on standard, baseline utility packages inside existing slums.	○
BSUP	Even though its policy intended to include upgrading, in practice it adopted the approach of merely constructing new housing units.	●
SNP	It is a participatory upgrading model that retrofits existing communities with individual toilets, water supply, and street paving.	○
S&S	Subdivided land parcels and infrastructure plots are developed from scratch for new construction	●
SUP	While it deals with shelter and land tenure, the focus remains on upgrading the existing settlement footprint.	○

● IN SCOPE

○ OUT OF SCOPE

In/out of scope criteria is defined based on whether the programme focuses on relocation and new housing constructione rather than upgrading/improvement

Case study 1

Sadbhavna Nagar

BPSUP colonies

Under BSUP, 5 cities have been targeted, Ahmedabad, Surat, Rajkot, Vadodara and Porbandar. In Ahmedabad 33824 dwelling units were sanctioned. The rellocation site is next to Vatva Road, far out on the city periphery.

Due to the location's distance to the center, the relocation caused poor access to work sites, thus leading to increased costs, and in some cases, loss of livelihoods (Mahadevia et al., 2014).

The location of the ressetlement created anger within the residents. They felt that the alloted flats were barely a compesationnfor tearing down their homes, which were in prime locations (Salmi, 2019)



(author's image made using map from Ahmedabad Cross Section book, 2026)

Case study 1

Sadbhavna Nagar

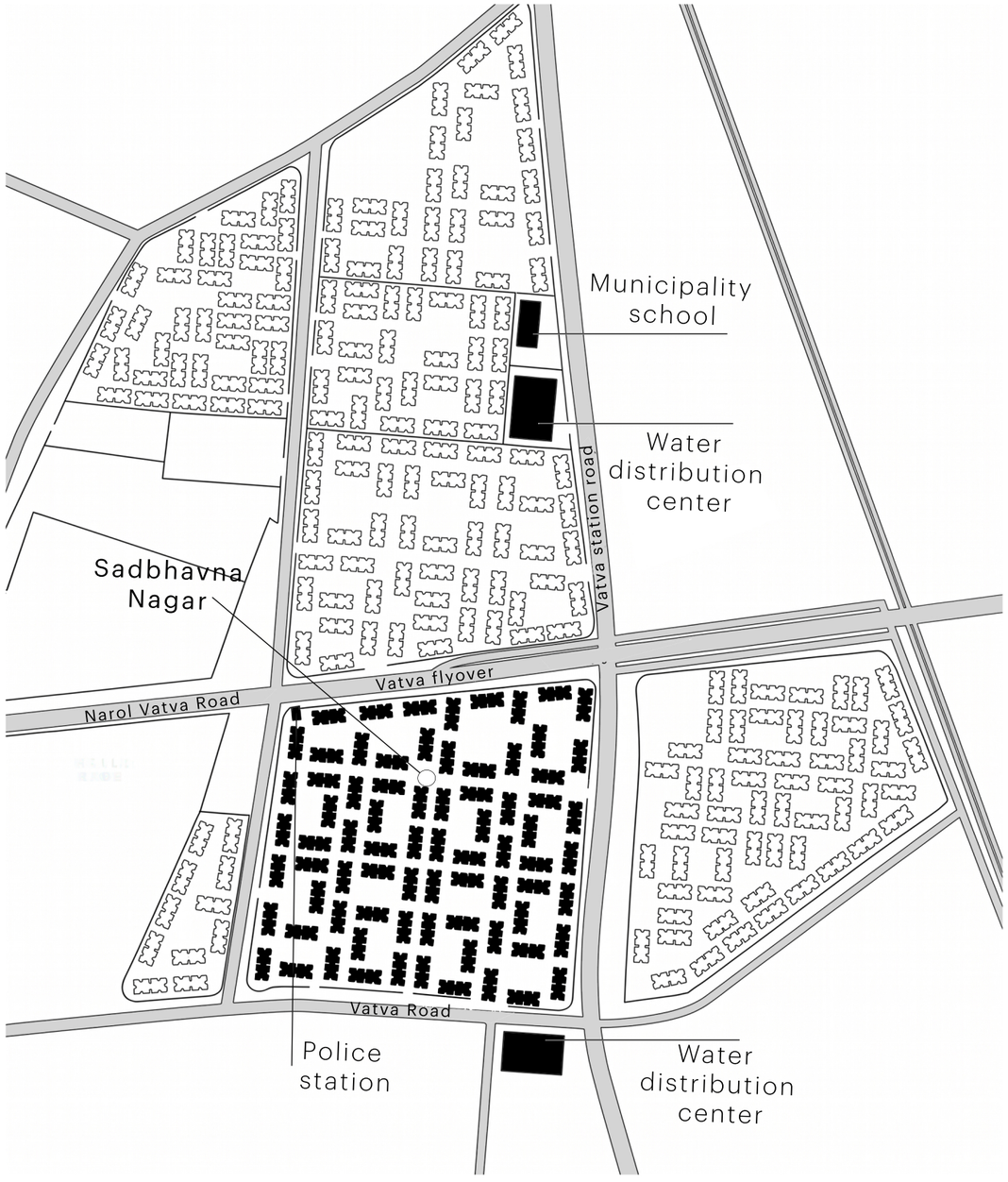
BPSUP colonies

The aim of the project was to rellocate as many people as people, creating a dense and vertical environment. The project followed the repetition of the same building.

However, moving the residents from informal slums to vertical building blocks caused issues. The sense of “street surveillance” was completely lost due to lack of common spaces. People lost the sense of community as well due to the random allocation of dwellings (Salmi, 2019).

In the thesis, Value of common open spaces for urban poor: A case of Ahmedabad, by Devashree Roychowdhury, the author describes that in addition to geographical segregation, the physical structure of the Vatva settlements serves to entrench and exacerbate existing socio-religious and caste tensions. The problem is further emphasized by the constant state surveillance in the area, represented by a police post right along the borderline. Rather than creating a design for public housing that aims to bring people together and unite communities divided by centuries-old tensions, the state uses architecture as yet another method to emphasize these borders and treat the urban poor as volatile individuals requiring containment (Roychowdhury, 2014).

If high density is achieved through stand-alone buildings, it creates social division and spatial isolation. However, the problem is not high density itself, it is how it is organized spatially.



(author’s image made using map from (Salmi, 2019) 2026)

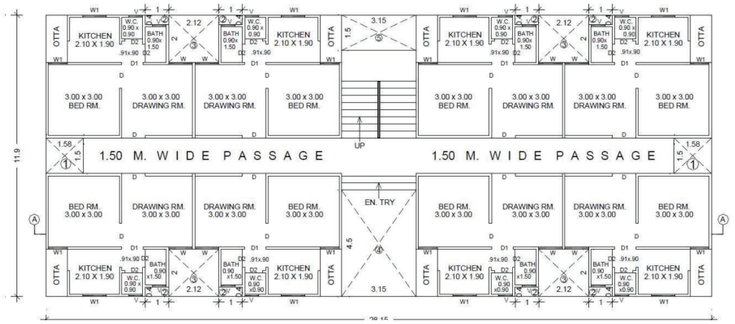
Case study 1

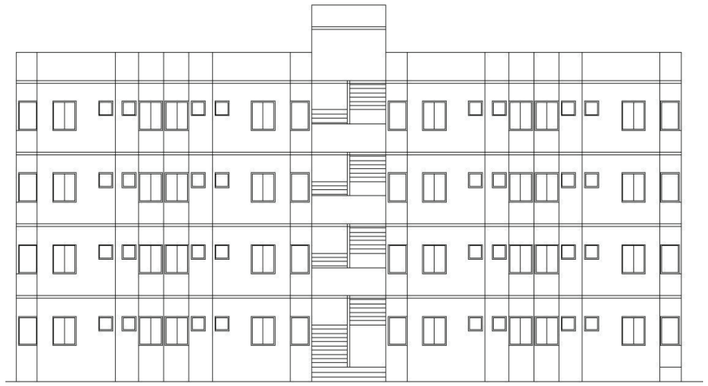
Vatva Resettlement

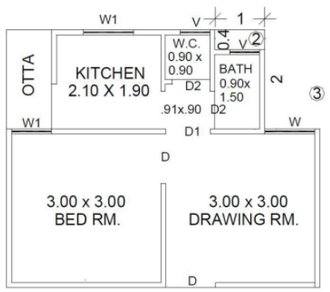
BPSUP colonies

Each floor has 8 dwellings, summing up to 32 residences per building. The buildings reach a height of G+3.
Each dwelling has an otta, a kitchen, a bedroom, separate toilets from bathing rooms and a drawing room. Every floorplan has all basic neccesities required, however the design would benefit from more open spaces that would eventually create a sense of belonging (Roychowdhury, 2014)

Contrary to rule 12 that states that the building should not be modified at all, residents have made changes to accomodate their needs. The residents turned hallways into storage spaces, empty dwellings into animal sheds and empty spaces into outdoor kitchens and backyards. Moreover, the walls of the buildings suffered transformations, the residents painted the walls in pastel colors and added grilles to all windows, creating a sense of belonging (Salmi, 2019).



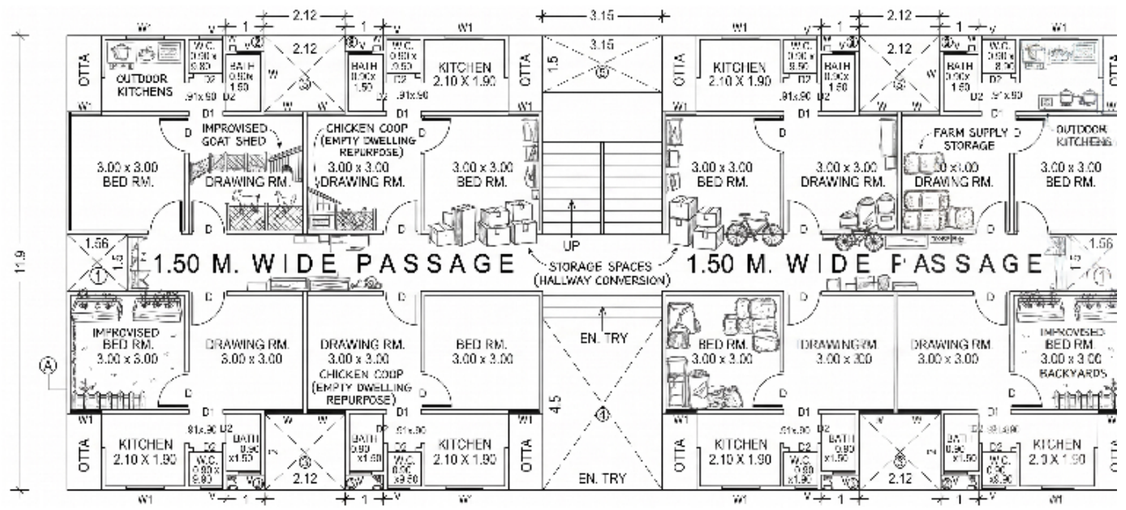




(Roychowdhury, 2014)



AI modified facade from Roychowdhury, 2014)



AI modified floorplan from Roychowdhury, 2014)

Case study 1

Vatva Resettlement

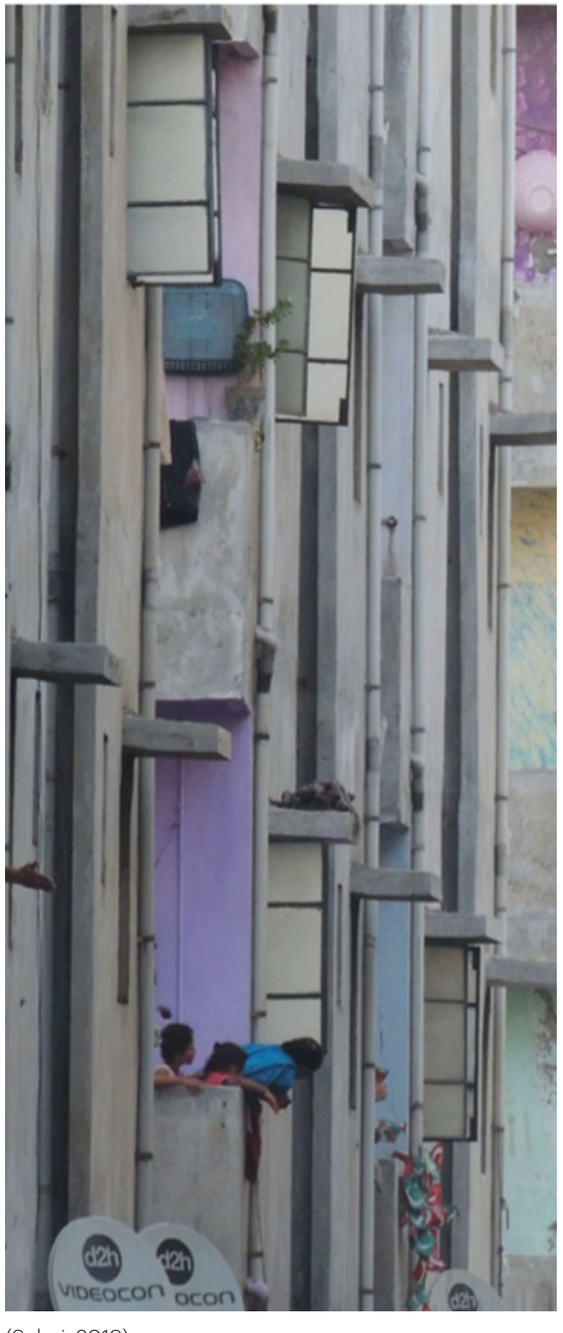
BPSUP colonies

Lessons learned:

The proximity to job opportunities is a crucial part when considering the location for migrant worker focused housing.

Another important consideration is the switch from informal settlements settings to a high-density one. Informal settlements, foster a sense of community due to the low rise constructions, expanding only horizontally. Switching to verticality creates a sense of isolation, unless communal spaces are taken into consideration. Moreover, the switch to a vertical system led to feelings of unsafety due to the lack of the "eyes on the streets" that exists among informal settlements.

Lastly, the target demographic has different needs among themselves, therefore creating a standard unit will not satisfy their needs, it creates a lack in the sense of identity by standardization.



(Salmi, 2019)



(Salmi, 2019)



(Salmi, 2019)

Case study 2

Aranya housing scheme (S&S scheme)

Balkrishna V. Doshi

Commissioned by the Indore Development Authority in the early 1980s and designed by the legendary, Pritzker Prize-winning architect Balkrishna V. Doshi (Vastu-Shilpa Foundation), Aranya was designed to house over 60,000 people across a broad socioeconomic spectrum.

The 85-hectare township was divided into six sectors. Instead of separating blocks by income, Doshi integrated them radially within each sector:

The Core: The poorest families were allocated smaller plots at the very center of each sector, surrounding shared green spaces, schools, and community areas.

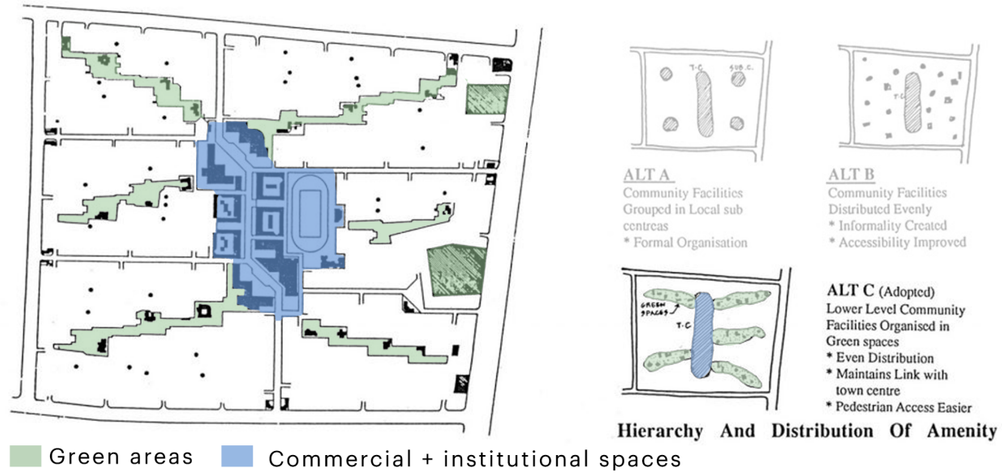
The Periphery: Higher-income groups purchased larger plots along the outer ring roads and the main commercial central spine. Because high and low-income plots lined the same concentric networks, they shared public infrastructure, schools, marketplaces, and parks, preventing economic segregation.

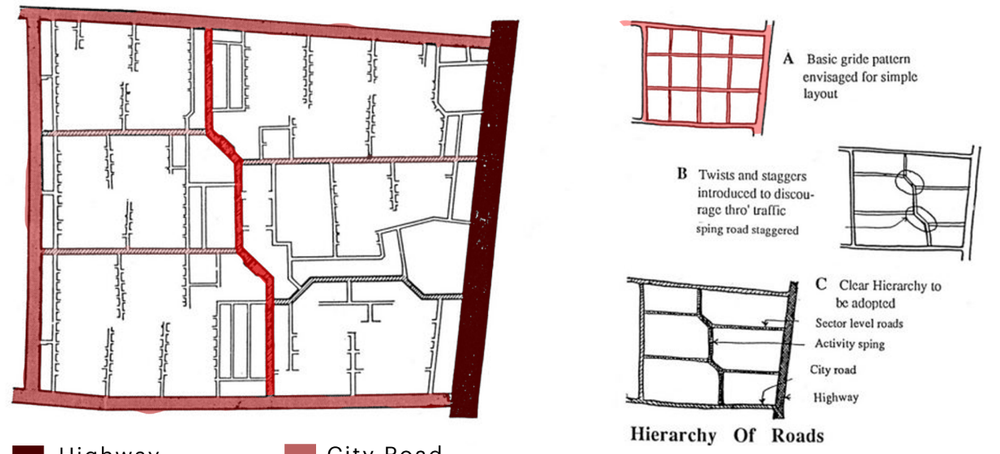
The land was subdivided into roughly 6,500 plots, varying significantly in size to match what different income groups could afford

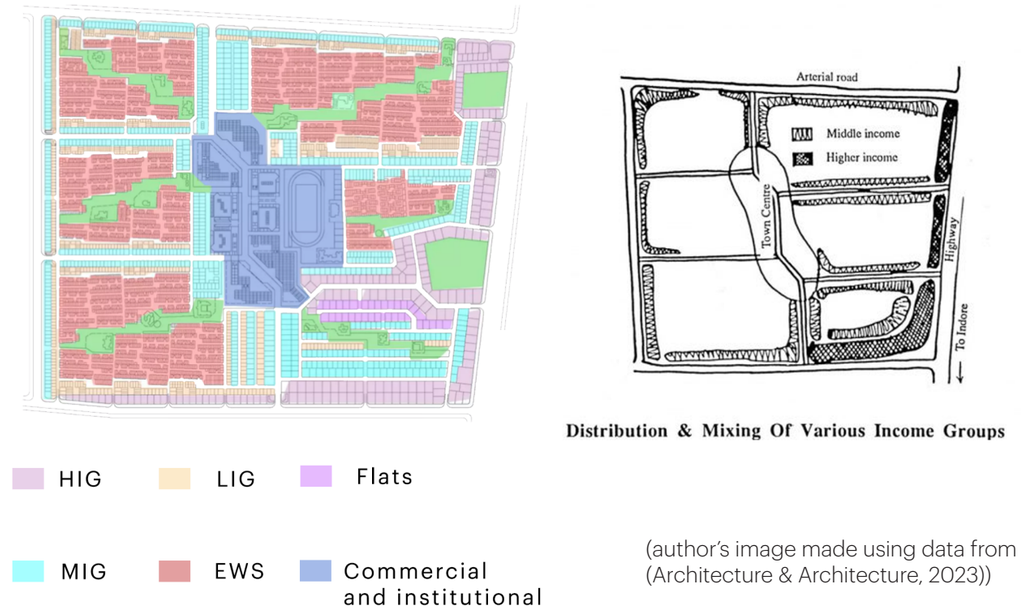
The financials: The project relied heavily on decentralized market dynamics. The World Bank and the local authority sold the larger, peripheral plots to high-income families and commercial businesses at market premiums.

The profit generated from these high-income sales was directly used to subsidize the development costs of the EWS inner plots. This allowed the poorest families to buy into the legal housing market via tiny down payments and staggered, low-interest micro-loans, without requiring direct, ongoing government construction funds.

Instead of handing out finished apartments, the project leveraged "sweat equity." The EWS families started with just their serviced plot and brick core. Over decades, as their household incomes grew, they built upward and outward—adding rooms, balconies, and storefronts.







(author's image made using data from (Architecture & Architecture, 2023))

Case study 2

Aranya housing scheme (S&S scheme)

Balkrishna V. Doshi

A typical layout for a house consist of a verandah, 2 rooms, a kitchen and a toilet and bathing room.

The formal architecture provided only what a family could not easily build safely themselves:

- A solid foundation block.
- A basic, weather-proof brick shelter.
- A service core which attached to a built-in kitchen hookup and toilet compartment connected to the city mains.

Lessons learned:

The Cross-Subsidization Model: The project used market dynamics to fund social good. The World Bank and local authorities sold larger, premium peripheral plots and commercial spaces to high-income families at market rates.

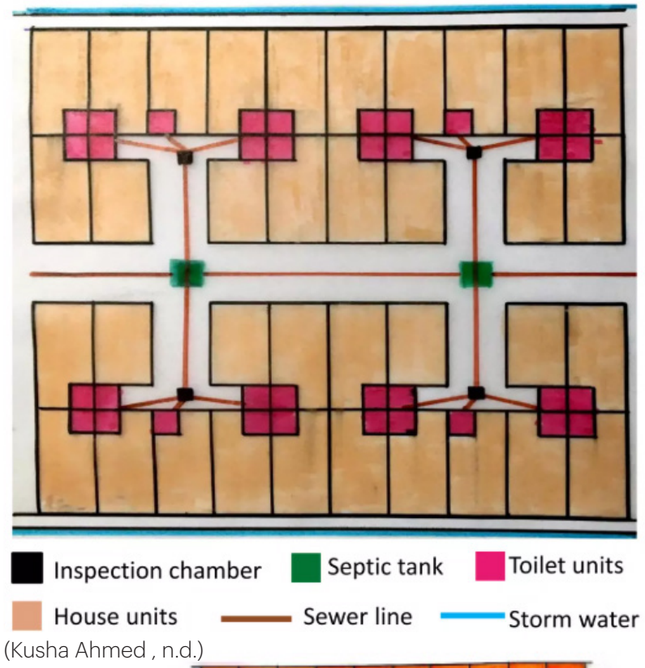
Funding the EWS: The significant profits generated from these high-income sales were directly used to subsidize the development costs for the Economically Weaker Sections (EWS) in the inner plots.

Empowerment Over Charity: EWS families weren't just given free apartments. They bought into the legal housing market via tiny down payments and staggered, low-interest micro-loans. This gave them true ownership.

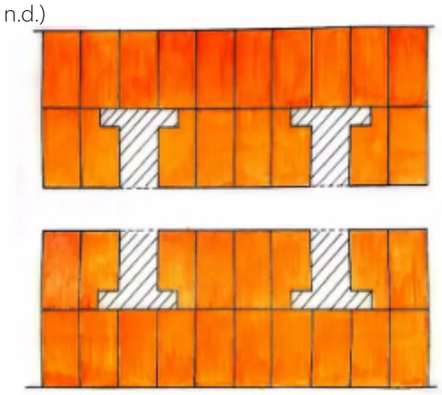
Leveraging "Sweat Equity": Instead of handing over finished, rigid structures, the project provided an incremental framework. Families started with just a serviced plot and a core brick structure. As their household incomes grew over decades, they invested their own labor and savings to build upward and outward.

The Core vs. The Periphery: The poorest families (EWS) were allocated smaller plots at the very center (core) of each sector, surrounding shared green spaces, schools, and community hubs. Higher-income groups (MIG/HIG) purchased the larger plots along the outer ring roads and main commercial spine.

Service cores: Two adjacent housing plots mirror each other's layouts so that their bathrooms and kitchens share a single dividing wall. Where four dwellings meet at their rear corners, all four wet cores are grouped tightly together into a centralized utility hub. These four wet cores drain directly into a single, shared inspection chamber.

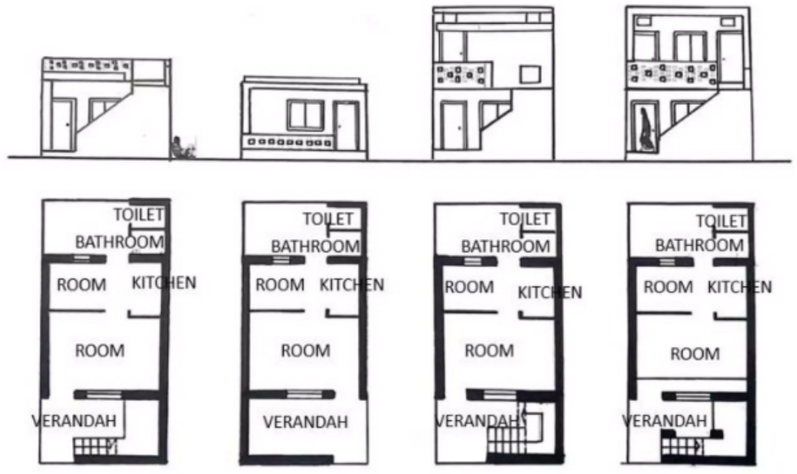


(Kusha Ahmed , n.d.)



PLAN OF 4 EWS CLUSTERS

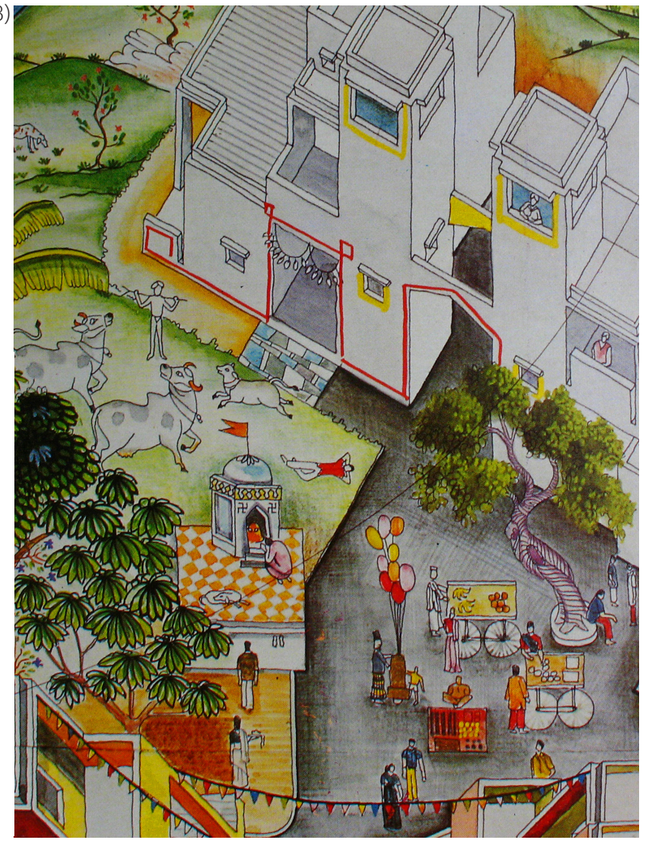
(Kusha Ahmed , n.d.)



(Hidden Architecture, 2023)



(Hidden Architecture, 2023)



The ideal home

While conducting the field trip, some residents on the plot were asked by students to draw their ideal living situation as a way of interviewing them, since there was a language barrier between us. Most of the people that were asked were kids, therefore a lot of the drawings were not relevant for the research process. However, one drawing made by a mom living on the Rajiv Nagar really stood out. The drawing illustrates a really colorful house, a very joyceful place, however looking at details, the drawing really reveals the unfavorable conditions they are currently living in and what they are truly missing. First of all, there is a fan, a power socket and light switch drawn inside of the house, clearly signaling a lack of ventilation, especially in the hot climate of Ahmedabad and lack of connection to electicity.

Moreover, outside a water fountain is drawn next to a tree and a kid playing on a swing. These elements reveal the lack of water accesibility the residents face currently and the desire to have spaces for children to play as well as a connection to greenery. By analizyng this drawing, the most urgent problems for the users were identified and confirmed, making ventilation, green spaces, children's play and water and electricity acess a top priority.



Chilldren's play

The roof become a social space

In urban sociology, "third place" denotes locations where people socialize that are not home, family, or work. In cities across India, reductions in space availability have made conventional open parks and neighborhood squares almost inaccessible. As a result, community rooftops have been seen as imperatively community-based designs.

Recent studies on terrace use in metropolitan Indian cities demonstrate that rooftops, as organically extended spaces for homes, provide a platform for social inclusion and reinforce community social networks (Transforming Rooftop Terraces to Third Places in Urban India, 2026). As per a nationwide spatial analysis, almost all urban dwellers, who have access to a shared or private roof terrace, want to use this space for collective social activities, rather than engage in solitary activities (Transforming Rooftop Terraces to Third Places in Urban India, 2026).

For children in Indian cities, the street level is often congested with vehicles and industrial pollution, and is unsafe due to the built structures. It is, therefore, a rooftop, safe from the risks of the ground level, that is a desired micro environmental space for play and exploration.

Rooftops are cultural spaces of play. During major seasonal events, like Uttarayan (Indian Kite Flying festival) during Makar Sankranti, the skylines of cities, like Ahmedabad, become a competitive space of kites. Rooftops are where children learn the spatial and socially cohesive wind patterns, passing down traditions and a sense of community.



(Jha, 2023)

(Gupta & Law, 2023)





(author's image, 2026)

Case study 3

Prestige University
Sanjay Puri Architects

Sanjay Puri Architects' design for the Prestige University campus in Indore, India, completely upends how we think about institutional buildings. Instead of designing a traditional, imposing multi-story block, the firm focused on integrating geometry and a highly interactive "roof play" to blend the architecture right into the landscape.

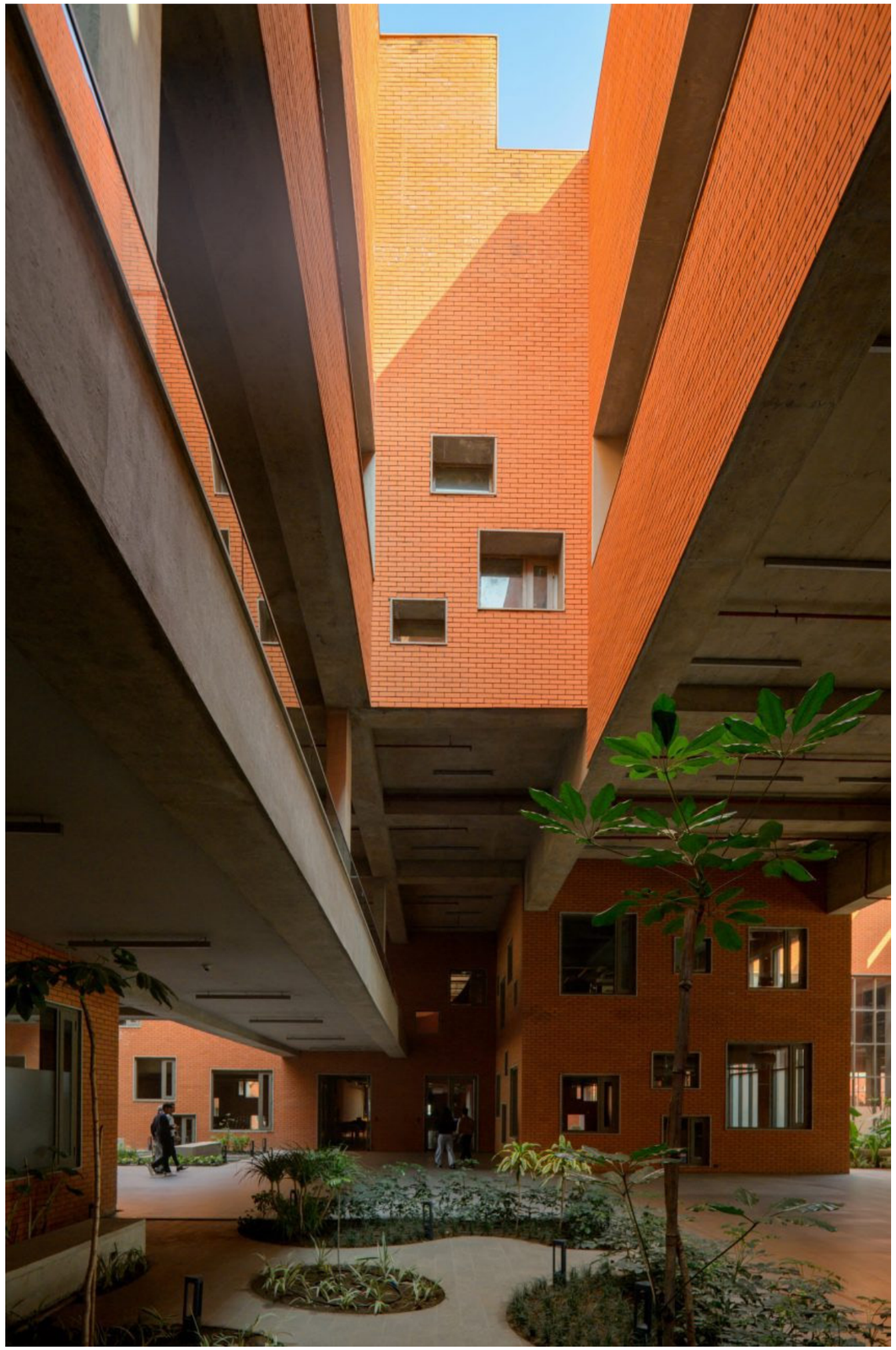
The structure's geometry is a direct modern take on traditional Indian stepwells (baolis). Historically, stepwells weren't just functional water reservoirs, they were vibrant, shaded community spaces where people gathered to escape the heat (Sanjay Puri Architects, 2022).

The geometry of the roof isn't just for aesthetics or social gatherings, it doubles as a massive passive environmental device. Indore suffers through temperatures between 30°C and 40°C for nearly eight months of the year, so the shape of the building was crucial to keeping it naturally coo (Sanjay Puri Architects, 2022).



(Sanjay Puri Architects, 2022)





Case study 3

Prestige University
Sanjay Puri Architects

The roofscape is deeply cut into by multiple open-air courtyards. These gaps channel indirect north light and deep natural ventilation down into the interior classrooms, library, and offices (Sanjay Puri Architects, 2022)

Inside, a continuous diagonal internal street cuts through the ground floor, working alongside the geometric shifting levels to draw warm air up and out of the structure like a chimney (World Architecture Community, 2023)



(Sanjay Puri Architects, 2022)



Case study 4

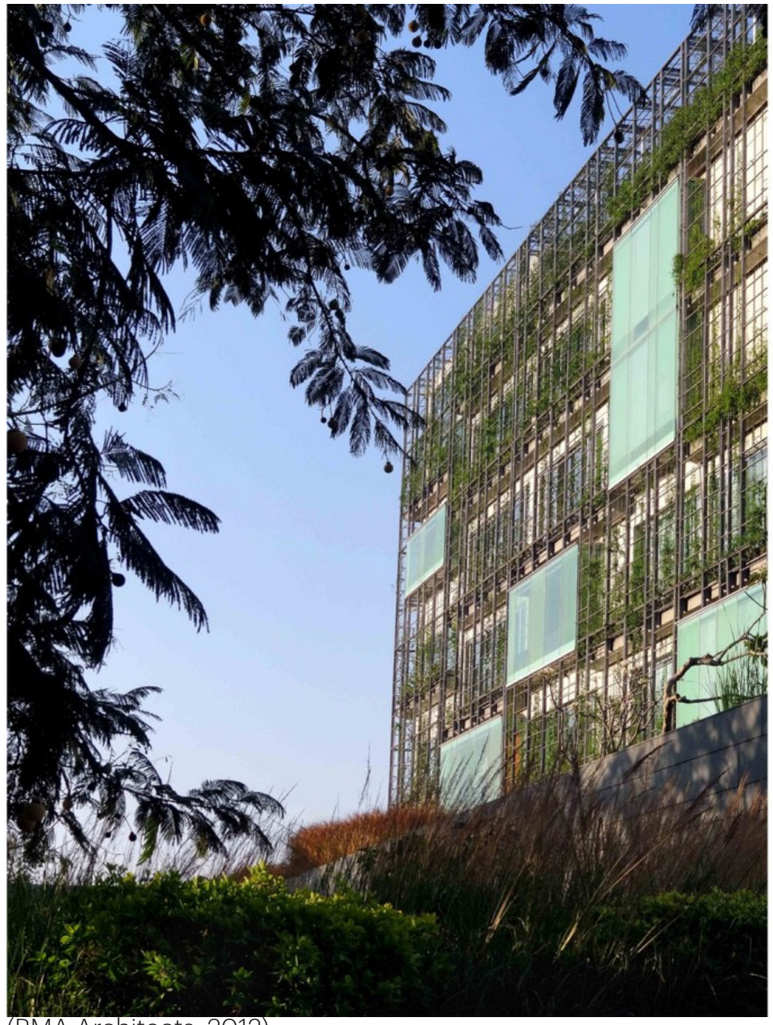
KMC Corporate Office
RMA Archiects

The KMC Corporate Office has been attributed to Rahul Mehrotra of RMA Architects and is a purposeful commentary against "impatient capital", which is the demand in the corporate world for quickly produced, uniform, boxy, sealed glass buildings, that completely disregard the specific climatic and material needs of the region (RMA Architects, 2012)

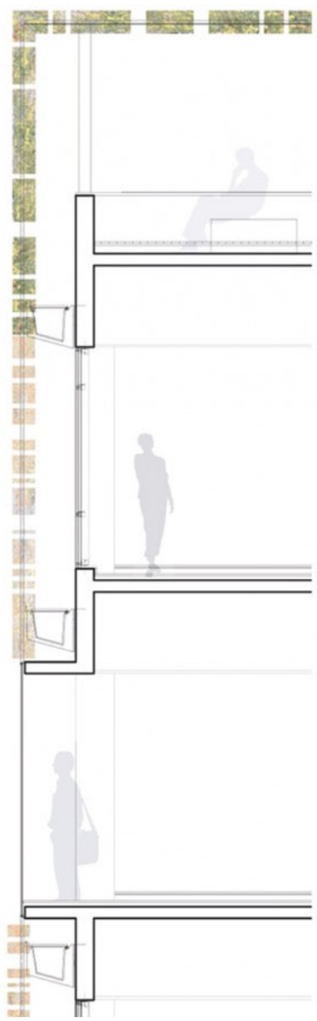
Finished in 2012, this project is a rejection of the "status quo" of reliance on mechanical cooling systems. It offers instead a high performance, living double-skin facade which works as a micro-climatic filter (RMA Architects, 2012)

The facade functions as a dynamic solar filter, and instead of treating sun shading as a banal, static problem to be solved with a coating of tint, it is integrated with an arrangement of climbing plants. Such an arrangement helps lower the overall Solar Heat Gain Coefficient (SHGC) of the building, while still maintaining views of the city (World Architecture Community, 2012).

Such shading functions with positive control, meaning control of the shading is in response to live vegetation, and is therefore seasonal. The shading provides low and dense cover in the summer and opts to be sparse, if not absent, in the winter (RMA Architects, 2012).







(RMA Architects, 2012)





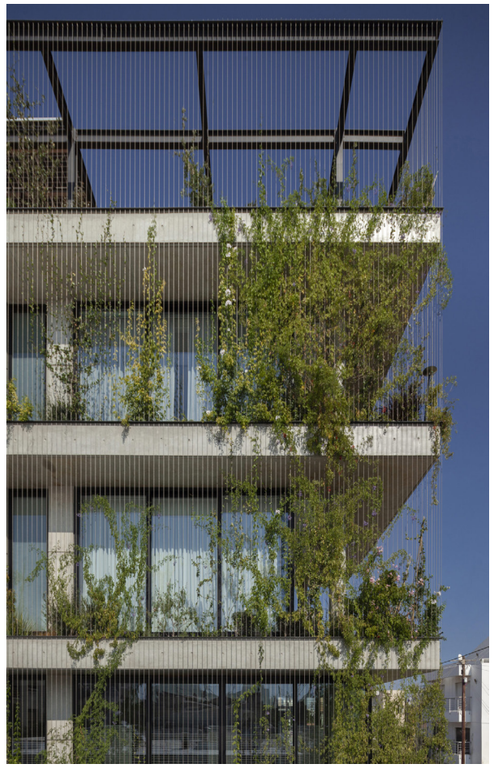
Case study 5

Urban Garden - Residential and Office Building
Loizou Architects

Loizou Architects + Associates have designed the Urban Garden mixed-use residential and office building to address the needs of the community in Limassol, Cyprus, while responding to some of the more worrying aspects of a hyper-densely developed urban environment (ArchDaily, 2023). Instead of designing a standard sealed commercial block, the firm concentrated on the microclimate, structural transparency, and biophilic design principles (Loizou Architects + Associates, 2023).

The primary concept of the design is to integrate the microclimate of Cyprus (ArchDaily, 2023).

The thoughtful design of the Urban Garden building provides a buffer of vertical garden space and living screen at the building's perimeter, which breaks the monotony of an industrial style building and provides a screen for the street and a shield to the building's occupants from unwanted visual and aural intrusions.





(RMA Architects, 2012)





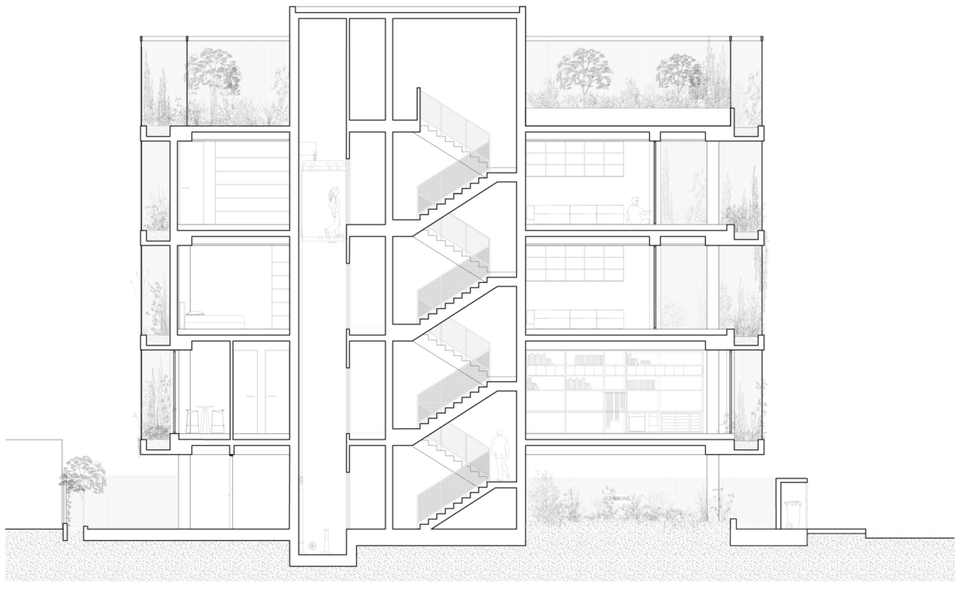
Case study 5

Urban Garden - Residential and Office Building
Loizou Architects

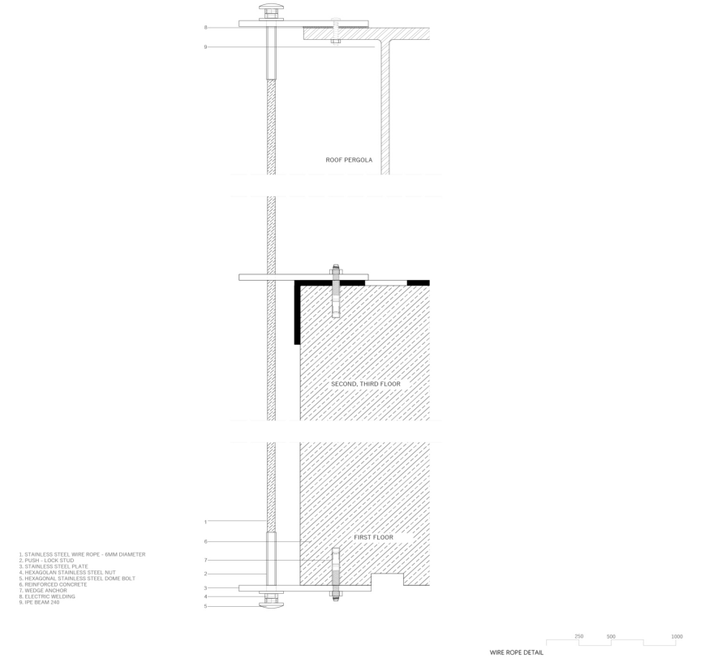
On each level, deep, unrefined, raw concrete planters are cast directly into the structural floor plates of the balconies. These planters wrap around the face of the building and provide a vertical support to native, cascading and climbing vegetative soils which allow the building to integrate the landscape (Architizer, 2023; ArchDaily, 2023).

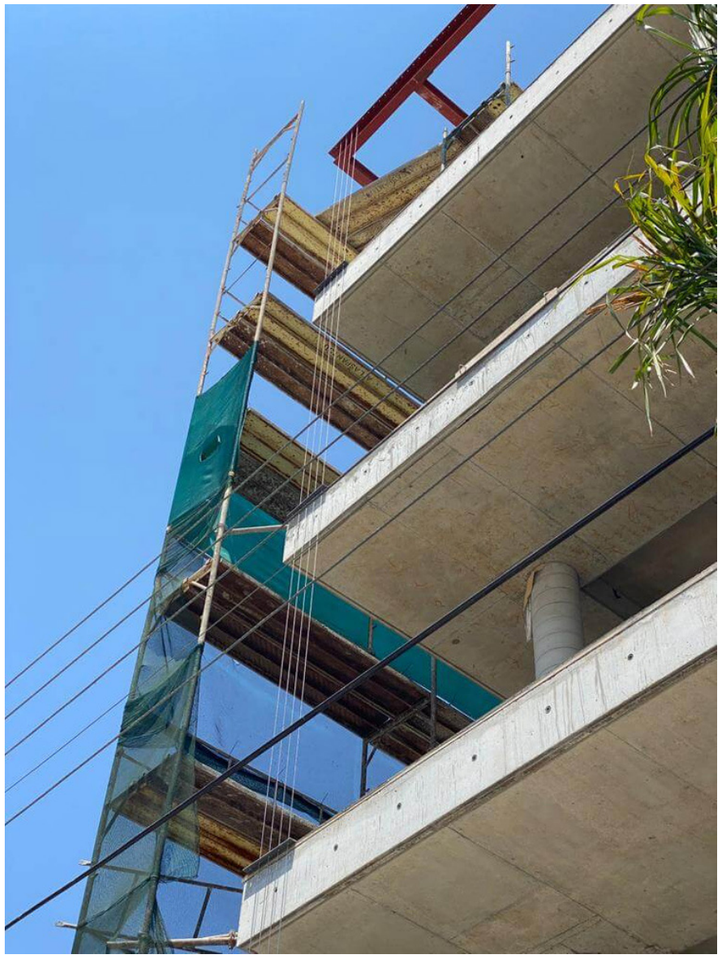
A combination of exposed, unrefined, raw concrete, deep verandas, and large sliding glass panels, along with a porous layout, allows sea breezes to cross ventilate the floor plates (ArchDaily, 2023). These methods create a comfortable indoor environment without relying on HVAC systems.





(Urban Garden | Loizou Architects + Associates – Arch2O.com, n.d.)





Rajiv Nagar
Site Analysis

The Rajiv Nagar site is located in South West Ahmedabad, India.
Currently the plot is occupied by an informal settlement, being resided by migrant worker families.
The plot houses roughly 200 families, which was estimated by counting housing settlements from sattelite view.
Total area is 31.500 square meters.



(author's image, 2026)

2015



2016



2018



2026



(Google Earth, 2026)

31.500
sqm.

200
households

Rajiv Nagar
Site Analysis

Compared to the Vatva ressetlement, the Rajiv Nagar plot is placed closer to the city center, located next to a metro station and other communal transport methods.

The current inhabitants of the plot are migrant workers, making this site ideal for the focus of this thesis.

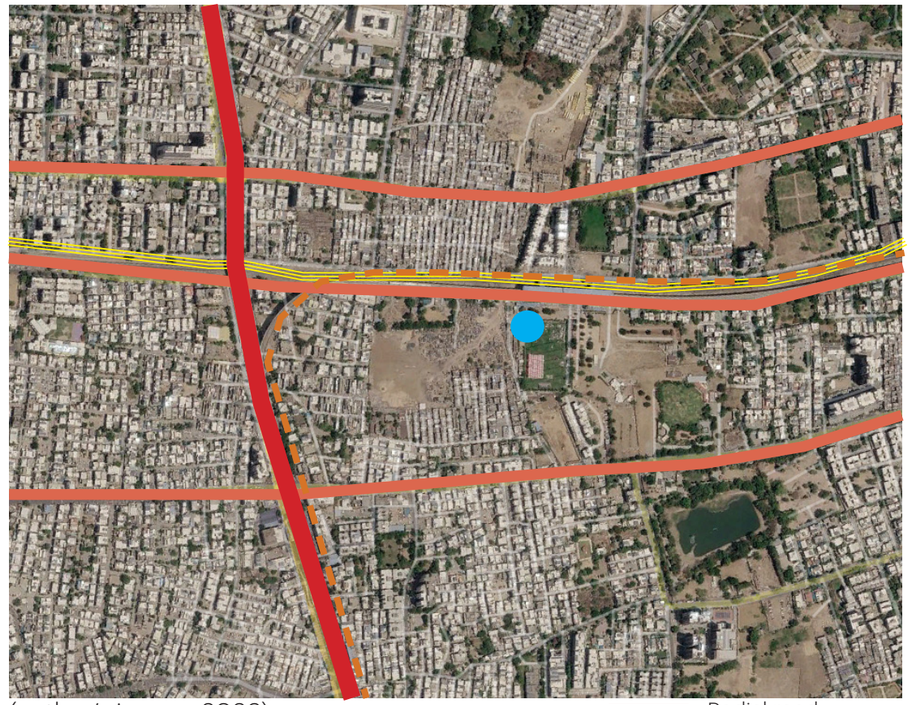
The plot is located in an area with a base FSI of 1.8 and a maximum allowed without permits of 2.7.

The area is limited at the North by a metro line and a train track. On the right upper side, an entry to the Rajiv Nagar metro station is located, increasing the land value. Behind the tracks, an upgraded slum settlement is located as well as some taller G+7 social housing blocks. The average height surrounding the plot is G+3. On the West side, a low to middle income group of housing is located. The East side represent a striking contrast, being a large empty field used for events. On the South side, a loe income settlement borders the plot.

The area is well positioned close by to a radial road, facilitating accesibility.



(author's image, 2026)



(author's image, 2026)

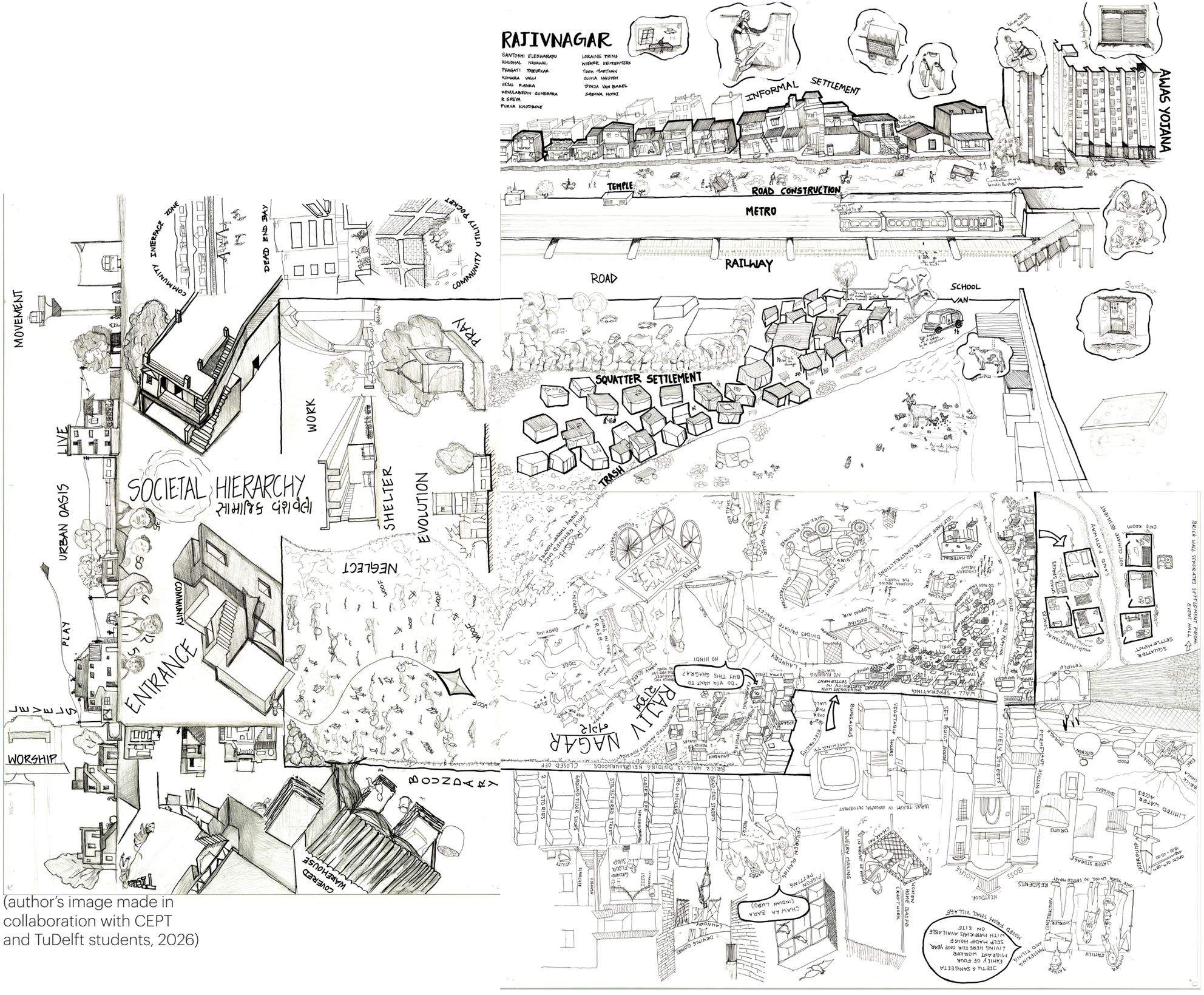
Radial road
Primary road
Train Tracks
Metro line
Metro station



(author's image adapted from the work of CEPT students, 2026)

Field trip

Sketches and photos were taken to document the environment, and later in a mixed group of TuDelft and CEPT students it was drawn out into a map.

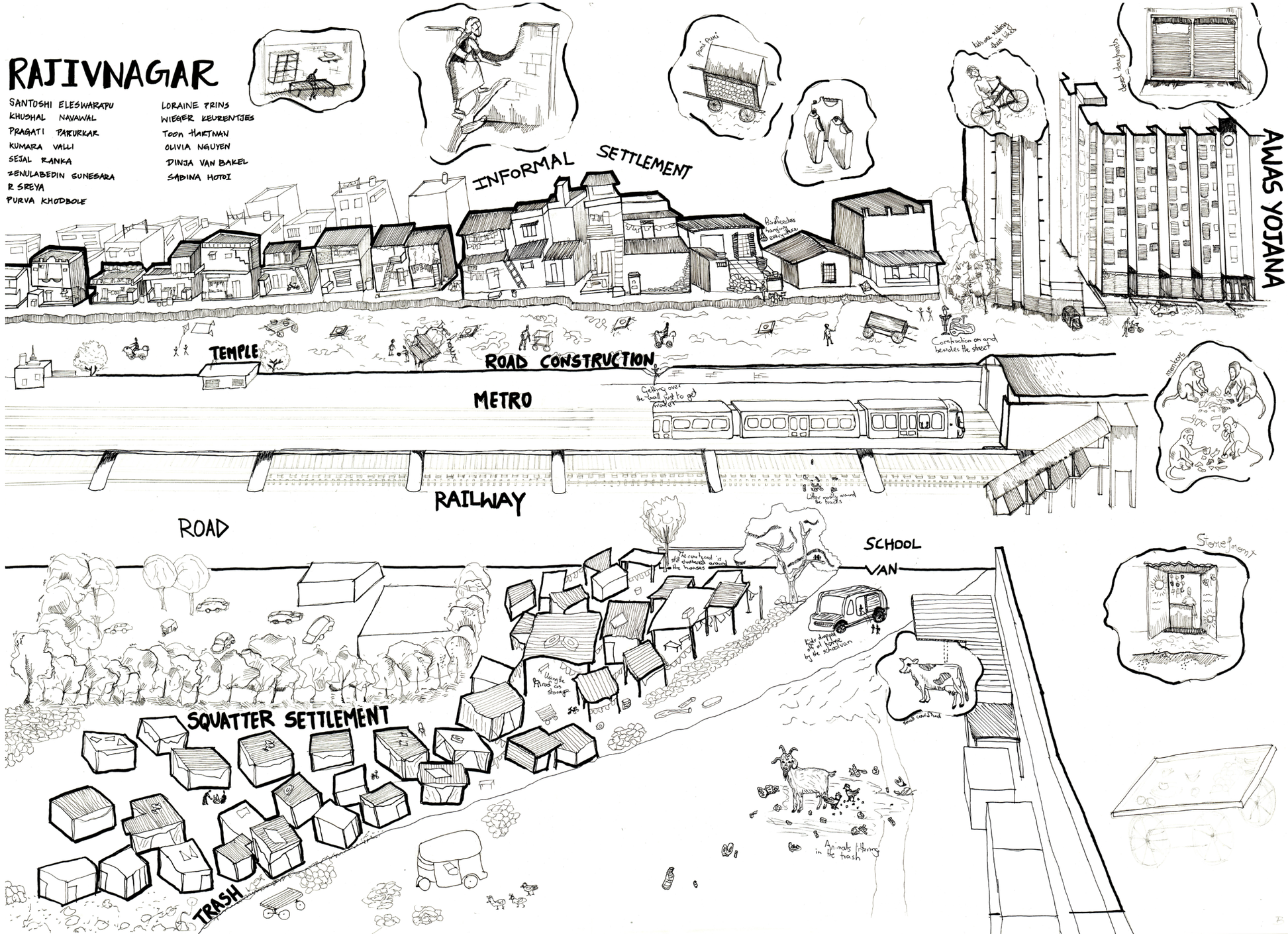


(author's image made in collaboration with CEPT and TuDelft students, 2026)

Field Trip

The Northern Border

The Northern side becomes a harsh border to the plot because of the metro and train line, but also ensure close proximity to public transportation. Going higher up, from the metro a complex of G+7 buildings stands out. Next to it, there is a redeveloped informal settlement, fluctuating from G+1 to G+3. In front of this settlement there is a wall, ensuring separation between the train line and the inhabitants. While walking through the area many of the residents were unsettled by our presence, thinking we might work for the Gouvernment. Their reaction clarified a serious issue between the two parties and signaled a lack of trust for the migrant workers in the Gouvernment.



(author's image made in collaboration with CEPT and TuDelft students, 2026)

Field Trip

Walking the area

At first glance, the landscape looked completely overwhelming. All settlements used materials they had at hand resulting in a vast sea of textures and colors.
A striking aspect was the garbage found all over the place. There were a lot of construction debris, which revealed that the plot was used as a construction dumping site.
A pattern noticed during the site visit were the cooking habits. The residents cooked food outside, on the ground. Initially the conclusion drawn was that it was because of the lack of space and ventilation indoors, but after discussing with CEPT students, it was revealed that they actually prefer it this way and even if they were provided with a proper kitchen they would still prefer cooking outside.
As mentioned before, the site has no connection to electricity, so the inhabitants connected their houses to neighboring houses's power supply, facilitating illegal acess to electicity.
A striking element seen in most houses were TV's. Most families had a television in their living room, highlighting how important time spent together is and how their everyday life revolves around the living room.



(author's image, 2026)





(author's images, 2026)



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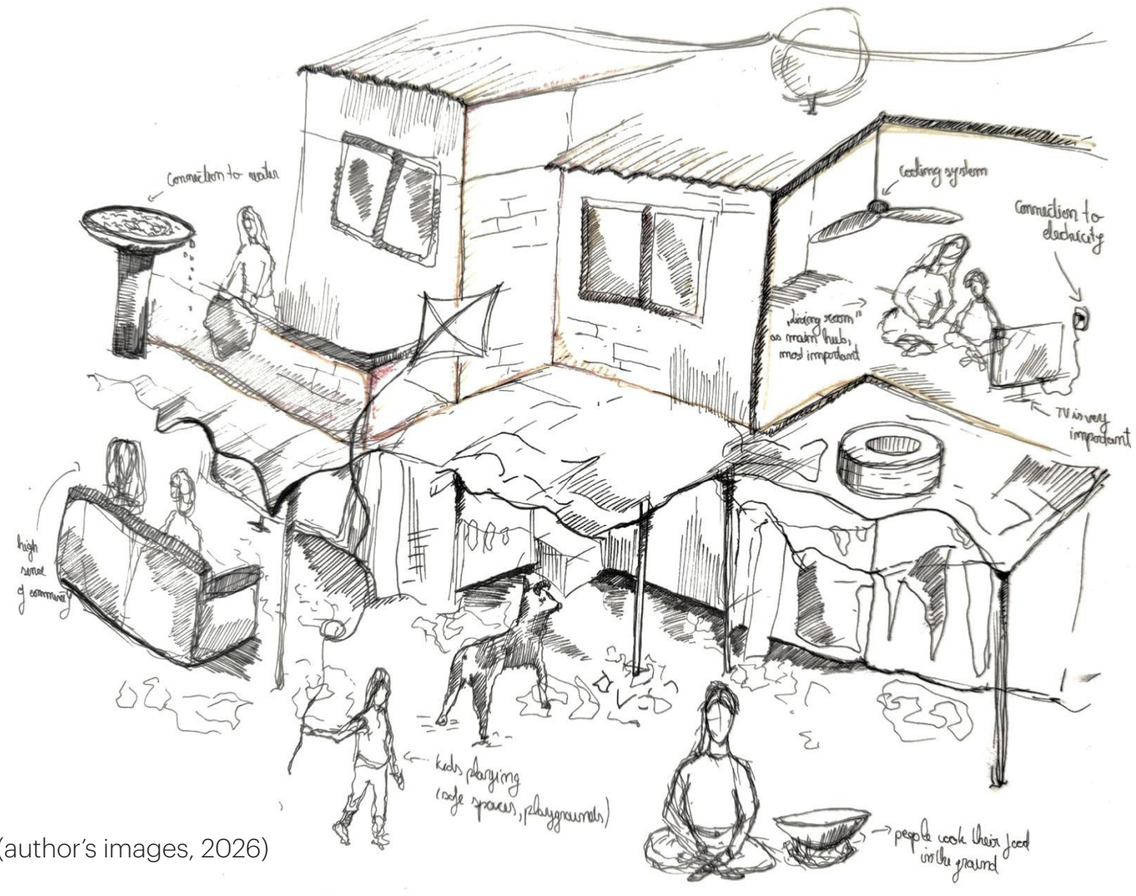


(author's images, 2026)



(author's images, 2026)





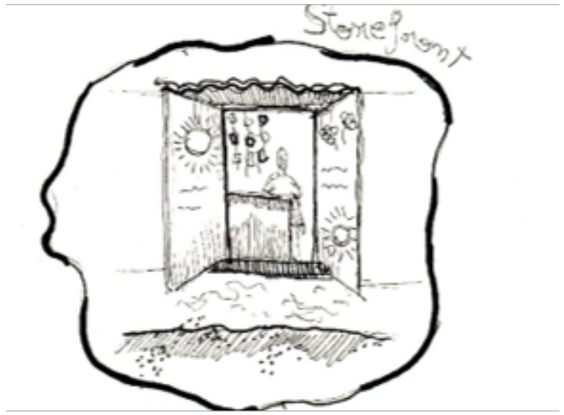
(author's images, 2026)

Field Trip
Observations

One important element noticed was people from the Rajiv Nagar plot would cross over the train line and jump over the fence to get water, since they did not have their own connection



There were a lot of storefront present, showcasing that the residents opened up their own local business to generate income.



Another element present were food arts, filled with pani puri or fruits. Once again, showing that the inhabitants actually make use of any business opportunities they may have at hand.



"Gasoline" flasks filled with water were present everywhere. There were only a few spots available to fill them up, so storage was much needed.



(author's images, 2026)

Field Trip
Observations

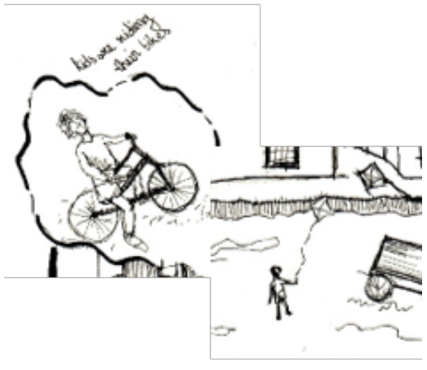
At the entrance of the plot, while we were there, a school van dropped kids of from school. However, only a small number of kids attended school, the rest spent their day on the plot due to their families not being able to afford it.



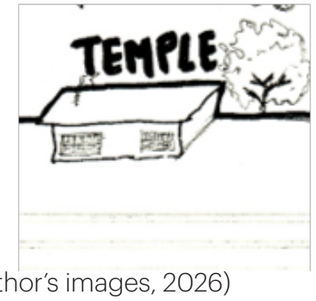
Similar shop fronts as the ones from the upgraded slum could be noticed on the ground floors of the G+7 buildings. However, these spaces were not in use and were deteriorating. A clear distinction between the lively street of the informal settlements and the ground floor space was formed. The ground area of the towers lacked any social spaces and community feeling.



Another observation was children's play. Shared spaces were full of kids riding bikes or flying kites. Despite not having proper playing areas they still managed to find activities to distract themselves with and have fun.



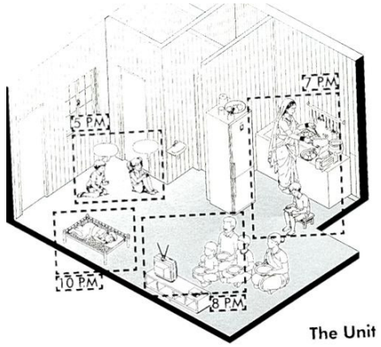
Lastly, the spiritual connection was felt everywhere through the improvised temples they had. The communities would build their own spaces to pray, making religion a very important element for the well-being of the community.



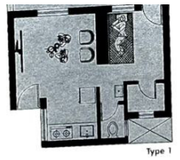
(author's images, 2026)

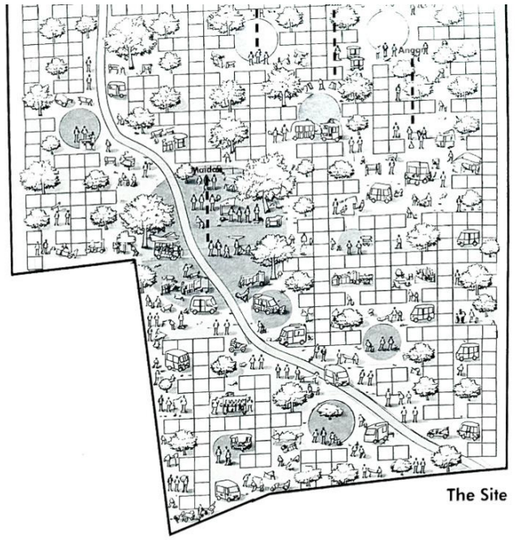
A day in the life of Raju

A second exercise was conducted to get a better grasp of the life of migrant workers on the plot. This exercise was executed by looking through the lense of a migrant kid living in an ideal environment on the plot. This exercise illustrates the different spaces his activities would take place in. His day consisted of going to school in the morning and returning in the afternoon. Then he would play with his friends and siblings, while his mom was cooking. In the evening they would all gather around in the living room and watch television together.
The activities with his friends would take place in a plaza next to his home, which is called Angan. Each Angan had it's own water fountain, green areas and safe spaces for kids to play. The scale of the plazas would zoom out illustrating the transition between a dwelling, a building, a cluster and the whole site.
Zooming out into the space created at a cluster level, a new open area is formed called Chowk, this area facilitates vehicle access as well as a central green area for leisure activities.
Zooming out further, the Maidan represents the center of the plot, where all clusters meet, and is used as community space for festivals and other events.
Lastly the exercise illustrates a shop front towards the metro and car street used by the residents. The shop fronts represent business opportunities for the migrants. The position of the shops also shelters the inside of the plot, the living environment from the busy street and creates a safe space.
This mapping exercise clarified the importance of communal spaces and the clear order these spaces should be formed in, from the smallest scale, the dwelling to the whole plot.

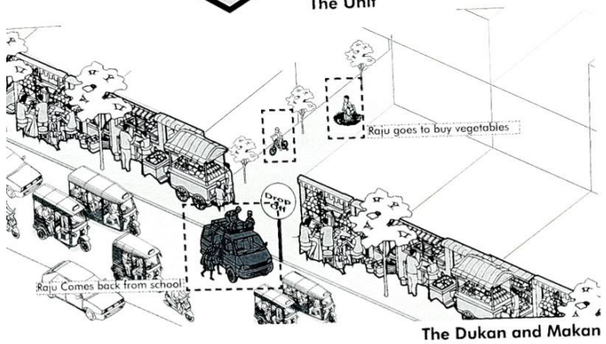


The Unit

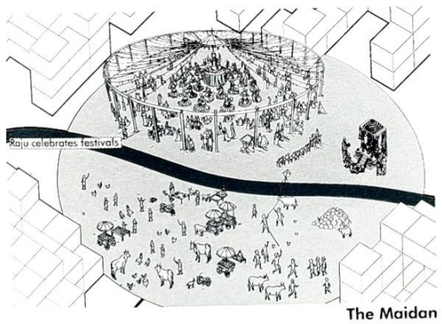




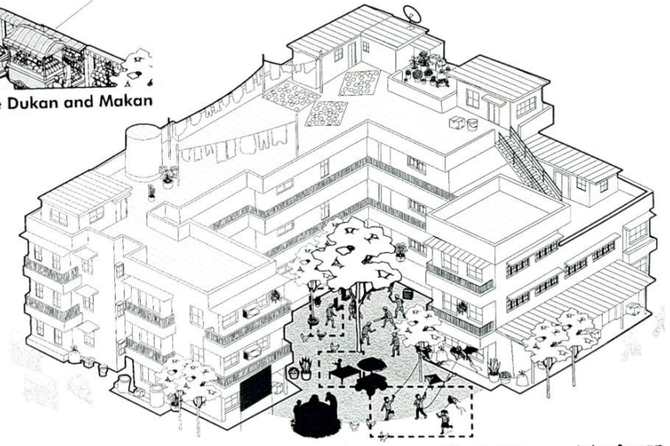
The Site



The Dukan and Makan



The Maidan


The Building and the Angan



The Cluster and the Chowk

(author's images made in collaboration with CEPT and TuDelft students, 2026)

Stakeholders

Migrant workers (EWS)

Purchase unfinished apartments at base construction cost, paying via long-term, accessible installments. They contribute "sweat equity" by performing self-build or internal infill labor to finish their spaces as their income stabilizes.

They represent the primary socioeconomic focus of the development, providing the labor force that sustains the city's broader economy. (Mahadevia et al., 2012)

Seasonal Migrants

Rent living spaces per month within dedicated on-site hostel facilities. They represent a semi-transient demographic that needs affordable, stable accommodation for a few months at a time during specific economic or agricultural seasons. (Desai, 2026)

Circular migrants

Access the most flexible tier of the site, renting a spot nightly in the local night shelters. They move constantly between rural villages and the city, requiring immediate, ultra-low-cost safety and sanitation without long-term commitments. (Desai, 2025)

Low/Middle/High income residents

Purchase the ready-made, market-rate apartments built by the Private Developer.

Their premium purchases generate the excess profit required to cross-subsidize the entire development, funding the affordable infrastructure for the lower tiers.

World Bank

Provides long-term, low-interest international development loans and structural technical assistance to back the initial infrastructure rollout.

While they don't handle day-to-day operations, their strict underwriting guidelines enforce the target quotas ensuring EWS inclusion and market cross-subsidization models. (World Bank, 2022)

Private Developer

Invests upfront capital to construct the fully built, market-rate ready-made apartments for the MIG/HIG tiers. They also build out the basic structural shells/ unfinished units for the EWS category at construction cost.

They absorb the primary construction risks and execution timelines, acting as the operational engine for the project's real estate mechanism.

Mahila Housing Trust

Bridges the gap between institutional authorities and informal community groups. They mobilize migrant workers, establish trust, assist with documentation for installment schemes, and build internal neighborhood governance. (Oxfam, n.d.)

Ahmedabad Municipal Corporation

AMC acts as the central administrative node. They aggregate land, zone the project area, handle layout approvals, provide main municipal service connections (water mains, grid power, sewage trunks), and manage the collection of EWS installment payments.

They hold the ultimate gatekeeping power for local land allocation and utility integration. (Ahmedabad Municipal Corporation, n.d.)

Private landowner

Supplies the raw land through sale.

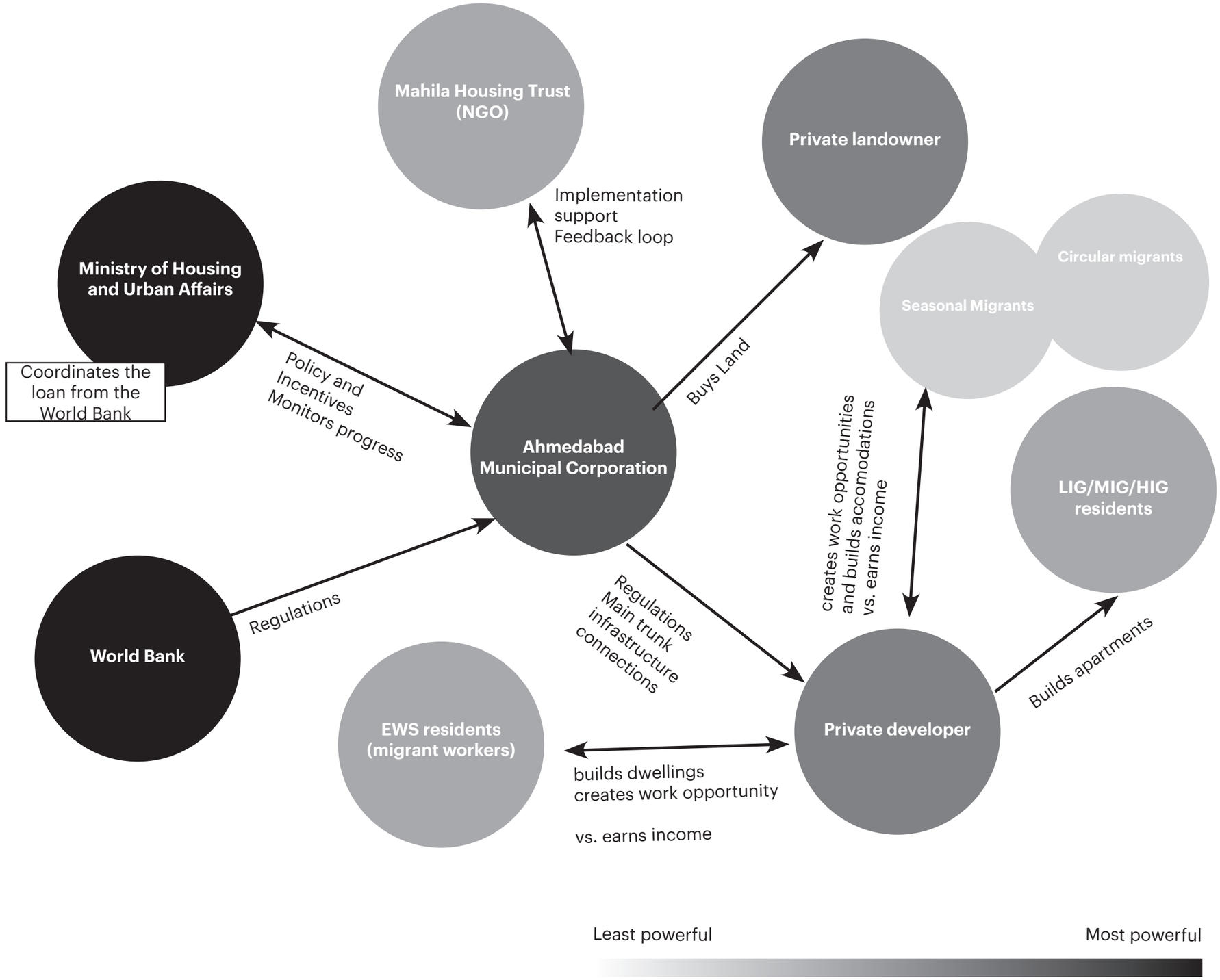
Ministry of Housing and Urban Affairs

National government body in India responsible for setting the rules, policies, and financial frameworks for how cities are built, managed, and developed. (Ministry of Housing and Urban Affairs [MoHUA], n.d.)

Stakeholders

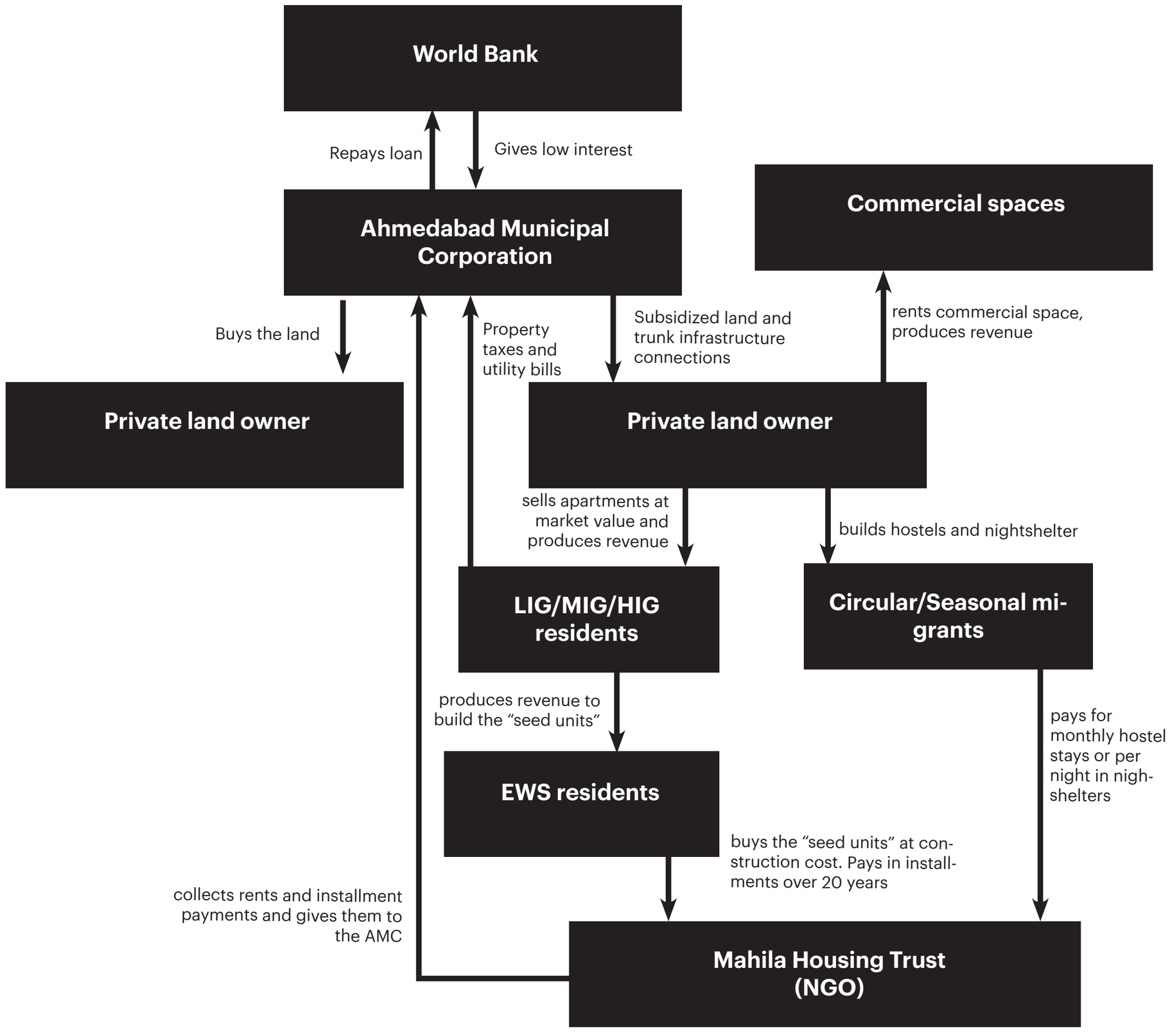
This housing project operates on a decentralized, cross-subsidized governance model inspired by the Aranya Housing framework. Governance is not managed top-down by a single entity. Instead, it functions as a multi-tier partnership where regulatory power, market capital, and community trust are interconnected.

In contrast to slums built on public land or resettlement colonies provided by the state, the informal migrant settlement at Rajiv Nagar is constructed on private land. This is important because, while adequate housing requires that occupancy be secure from harassment and eviction despite the absence of legal title, private land tenure systems may increase vulnerability to eviction if the occupants are considered "illegal".



Financial map

In terms of financial planning, the project will use a cross-subsidization model.
Middle, high and low income units will be created to generate revenue in order to cover for the upfront costs of the social housing units. The social units will be sold as independent wet cores, only structure no infill, to migrant families, reducing costs. The units will be paid in a certain interval of time and they will be sold at construction cost.
The hostel and nightshelter units will generate „rent" money, allowing for flexibility based on the duration of the stay.
Commercial areas will also be created to produce revenue.



Design Strategy

This design proposal uses the research's theoretical framework and breaks it down into different spatial strategies for each of the four linked scales: the dwelling, the building, the cluster, and the urban scale. For each of the scales, one or more of the research's sub-questions are addressed. Collectively, they work towards answering the main question of the research, which investigates how high-density housing can provide the flexible, socially dignified, economically integrated, and spatially adaptable housing for migrant populations.

Urban Level

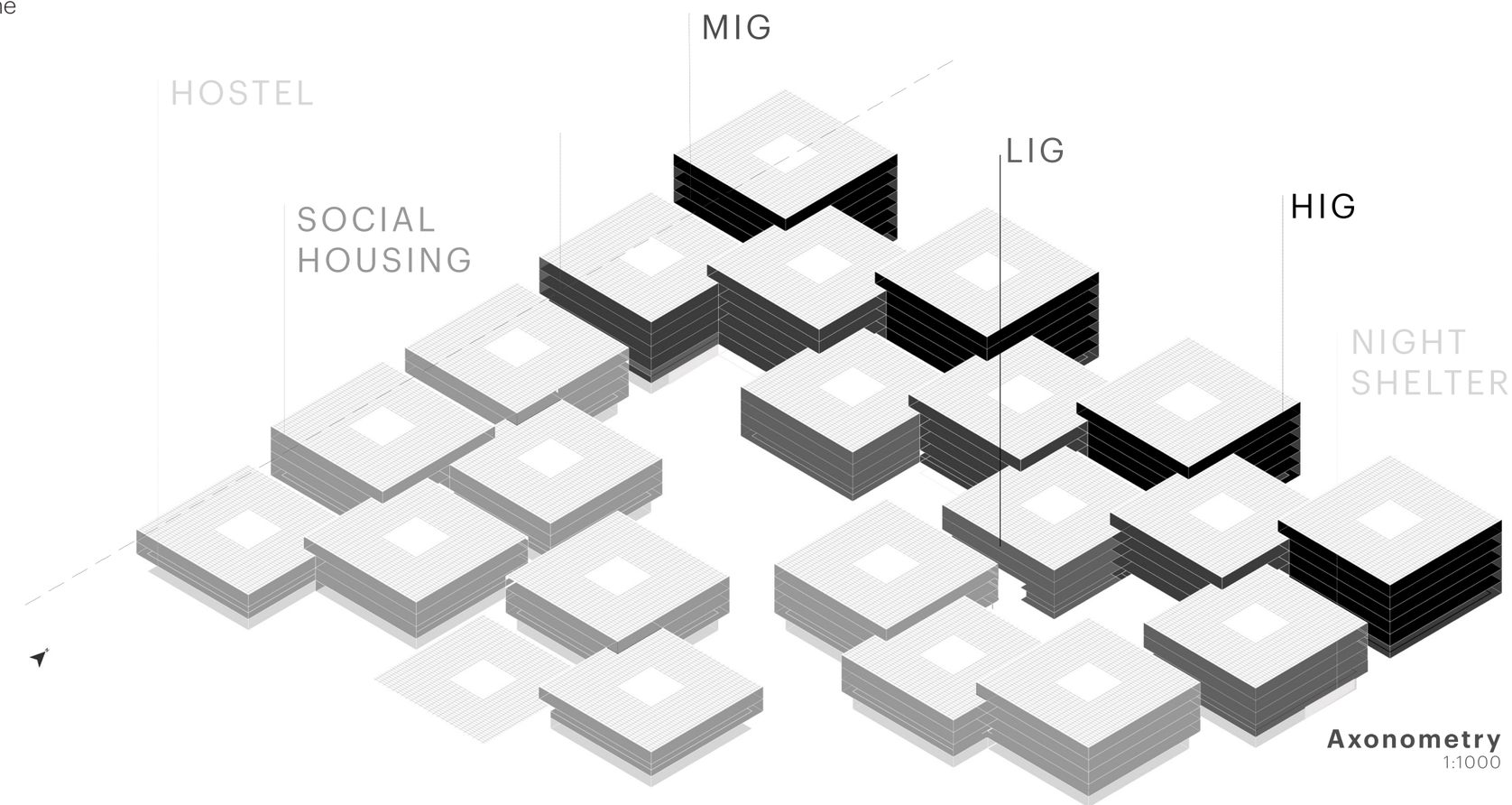
Design Strategy

The application of mixed socio-spatial hierarchy theory to the masterplan of the site has resulted in an intentional spatial arrangement. The tallest High-Income Group (HIG) buildings are located in the northern section of the site adjacent to the metro station and the busiest road where land value is the highest. An inward and southern shift in the development transpires from HIG buildings to Middle-Income Group (MIG) buildings, then to Low-Income Group (LIG) buildings, and finally to social housing units. This serves to gradually reflect an economic hierarchy, while also avoiding complete spatial segregation of different income groups. Contrary to the typical practice of spatially separating low-income groups, different housing typologies are interlinked, promoting accessibility through shared public spaces, circulation networks and integrated commercial facilities. The logic of the Aranya Housing Scheme is integrated in this, where different socio-economic groups were able to access combined streets, courtyards and general facilities (Doshi, 1982).
This urban savle aims to answer the sub question: How can spatial hierarchies and shared public spaces foster social interaction, informal economic activity, and integration between different income groups in dense housing environments?

452 social and low income
104 high income dwellings
92 middle income dwellings

FSI 2.7

GSI 45%



Axonometry
1:1000

Cluster Level

Design Strategy

On a cluster level the design strategy was creating one large building system rather than separate buildings. Therefore, the strategy was to put buildings side by side and connect them respecting their 9x9m grid, so connecting them on a 9 m edge. Every connection created new dwelling typologies, depending also on how the building was rotated.

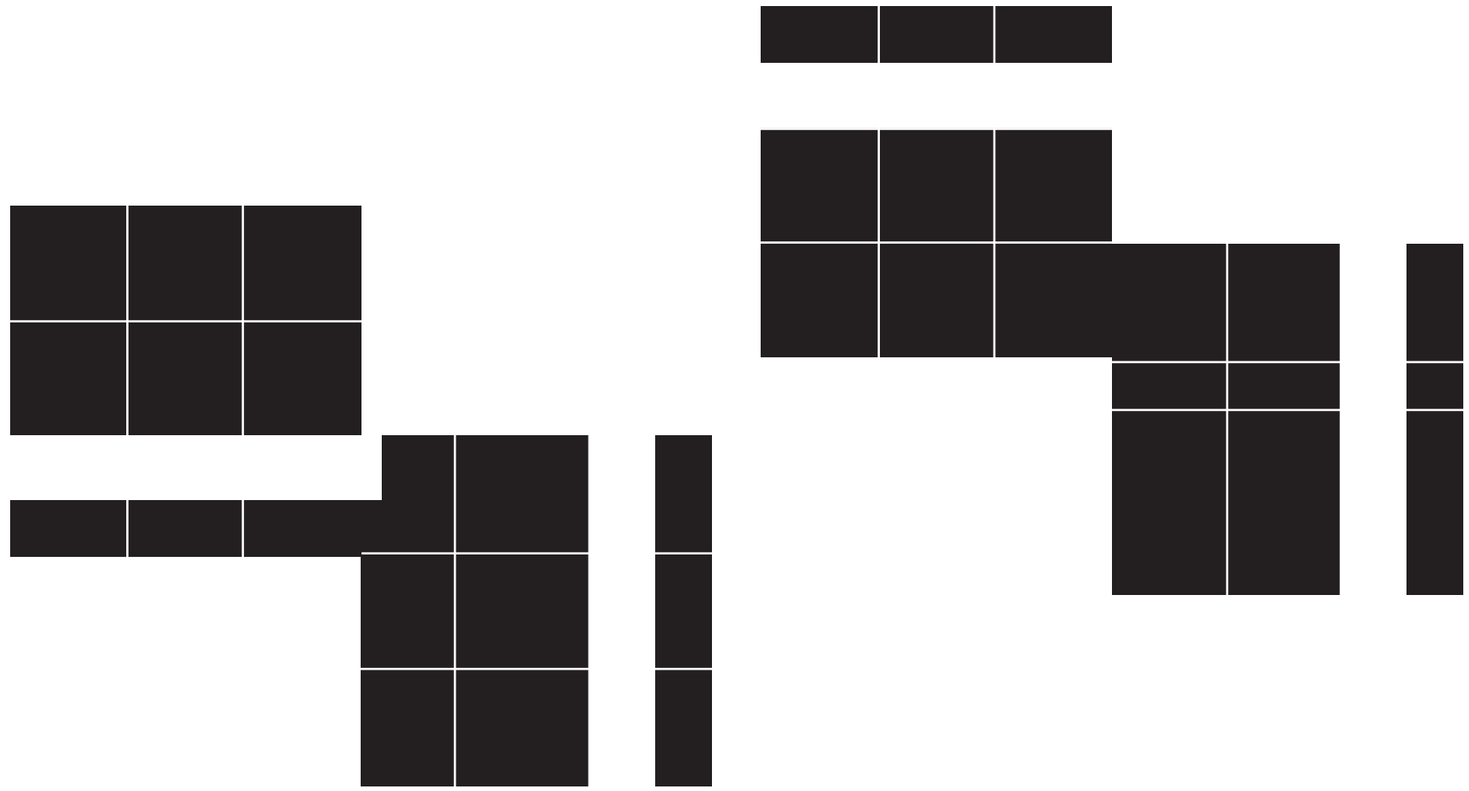
Through the interconnected circulation systems, the presence of communal spaces, and the absence of isolated tower blocks in BSUP resettlement colonies, Salmi (2019) argues that social alienation is largely created within such colonies. As a remedy, the project proposes interconnected cluster systems, where buildings connect through circulation systems, bridges, and other adjacent space(s) in the community.

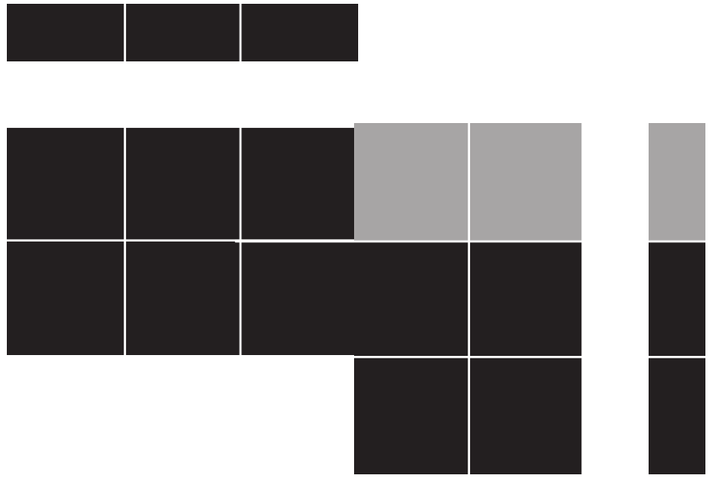
Unlike organizing buildings as objects, clusters contain one continuous urban fabric. The clusters resonate with the mat-building systems and recall the idea of architecture as a collection of systems with a complex network of integrated building elements, rather than an entire, static, and finished composition.

At ground level in the cluster, open, spacious social spaces serve as informal courtyards, where the community can meet, children can play, and relationships can be built. This “eyes-on-the-street” condition (Jacobs, 1961) helps maintain informal surveillance and a sense of collective belonging to the community.

The arrangement of the cluster was influenced by the scale of spaces and the hierarchy that was established in the “A Day in the Life of Raju” activity. It consists of a series of small private spaces (courtyards) that gradually expand in size to large communal spaces, thus transitioning from the private to the public. The scaling of the community spaces demonstrates the research findings that the combination of housing units and social infrastructures in the appropriate order are the dominant factors in the successful integration of communities.

Moreover, to avoid standardization, every different connection between buildings resulted in a new dwelling typology, therefore the project features 28 types of residential dwellings. There are 3 different building cluster connections, represented in the following diagrams, showing the location of the typologies formed and their position.





Building Level

Design Strategy

At the building scale the project aims to answers the question: What architectural and urban strategies distinguish socially resilient high-density housing precedents from projects that have produced isolation and spatial exclusion?

The buildings are worked around the same 4.5x4.5m grid. The strategy was creating a larger grid of 9x9 m, which created a 3x3 square layout. The centre is used as a circulation space, featuring two staircases while the side squares are used for apartments. Based on the income group the building features a different number of apartments per floor.

Building blocks are intended to function as part of a large interconnected system rather than isolated vertical towers, thus, rejecting repetitive standalone blocks.

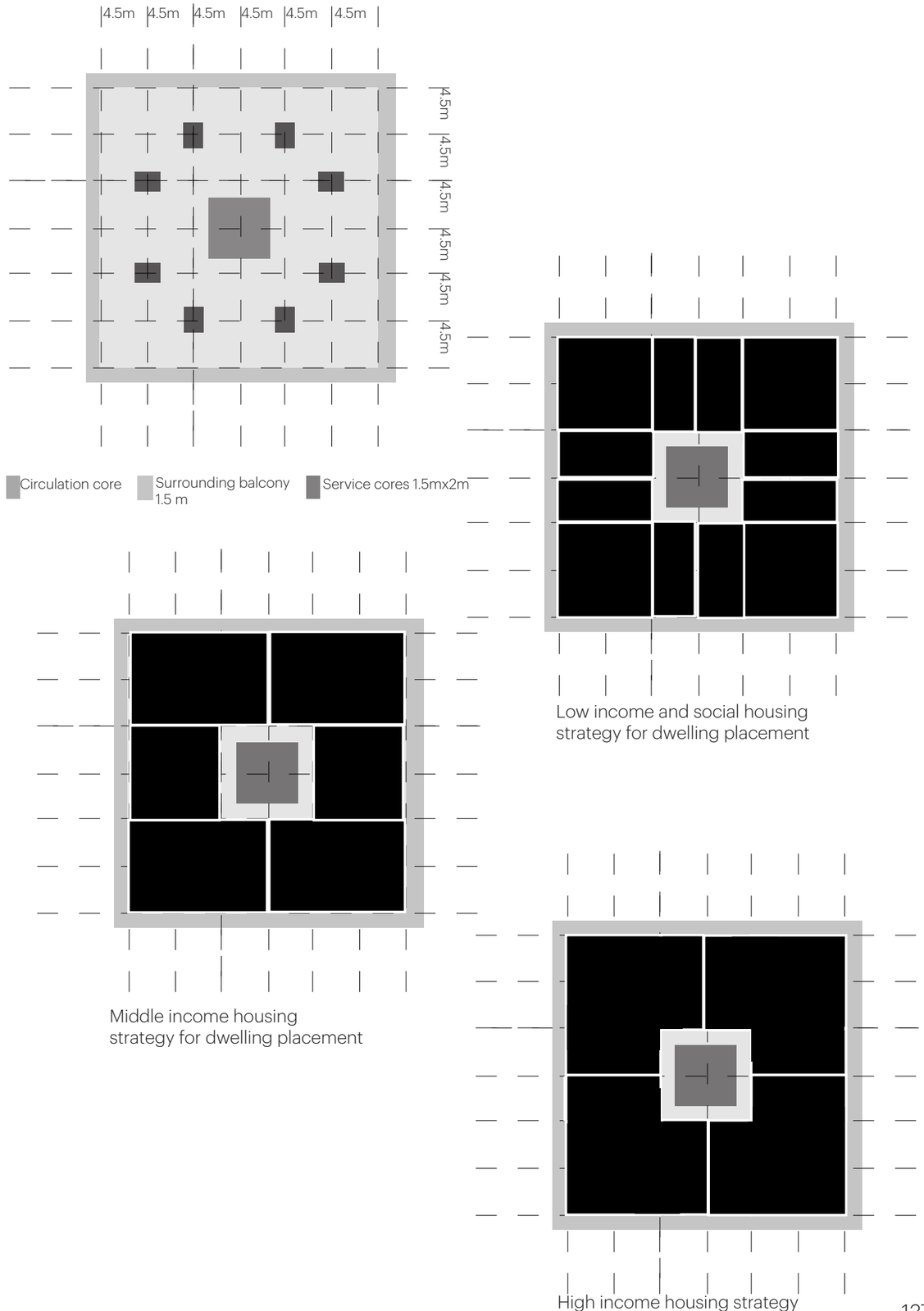
To improve permeability, large-scale openings at the ground and second floors are incorporated into the design. Along the central spine of the system, these openings allow users to move freely and access shared spaces. The openings function as tunnel systems for passive ventilation.

These tunnel systems respond to inadequate ventilation and overheating fieldwork observations of informal settlements, and integrate with central building cores as vertical ventilation shafts to promote stack ventilation.

The design of the Prestige University by Sanjay Puri Architects exemplifies the use of sectional voids to improve

air circulation and reduce overheating. In Ahmedabad, environmental comfort linked to the dignity of space becomes essential to assist in the relocation of migrant workers who

come from cramped, poorly ventilated informal settlements.



Low income and social housing strategy for dwelling placement

Middle income housing strategy for dwelling placement

High income housing strategy for dwelling placement

Dwelling Level

Design strategy

The Seed Unit and the alphabet

At the dwelling scale, the proposal answers the sub-question: How do varying temporalities of urban migration dictate the distinct spatial requirements and social dependencies of migrant workers? The research revealed that housing the workforce is a complex issue that encompasses circular migrants, seasonal migrants, and long-term settlers, each of which needs housing with distinct forms and different lengths of stay.

In this regard, the proposal offers a spectrum of dwelling typologies. For the circular migrants, night shelters provide ultra-flexible, short-term stay rooms. For the seasonal migrants, medium-term hostel units are constructed. Long-term migrant families are housed in expandable social housing units, which are organized in a cluster around an expandable core known as the “Seed Unit.”

The Seed Unit incorporates the theoretical construct of John Turner and N.J. Habraken’s housing as a process (Turner, 2005; Habraken, 1961). The proposal creates permanent infrastructure (framework, cores, and services) and leaves the rest for the future. What is permanent is the developer’s part vs. what is infill is totally the resident’s part.



The seed unit is described as a 4.5x4.5m grid system. Within the structure of the Seed Unit, a 1.5x2m service core is placed centrally, which includes the fundamental infrastructural components such as sanitation facilities. This is the permanent component of the dwelling unit built by the developer, whereas the rest of the space is free to be modified to suit the requirements of the residents as they incrementally build their dwelling. The Seed Unit incorporates the theoretical construct of John Turner and N.J. Habraken’s housing as a process (Turner, 2005; Habraken, 1961). The proposal creates permanent infrastructure (framework, cores, and services) and leaves the rest for the future. What is permanent is the developer’s part; what is infill is totally the resident’s part. Furthermore, the dwelling is extended through the use of a continuous private space or a terrace, which is 1.5 meters deep and surrounds each floor of a building. This space is multifunctional as it functions as a climatic buffer, a private space, as well as a transitional space between the internal space and the external environment.

Design Results

Design Results



At the center of the site, a commercial and social spine organizes the development. This spine contains retail shops, restaurants, markets, and a large green public space that can also function as an event ground during festivals and communal gatherings. The positioning of commercial functions at the center of the development reflects fieldwork observations from Rajiv Nagar, where informal storefronts and small businesses formed a critical survival mechanism for migrant communities. A retail front is also placed on the North side of the plot, along the main busy road. Rather than treating commerce as a separate urban program, the proposal integrates informal economic activity directly into the housing environment, supporting everyday livelihoods and reinforcing social interaction.

1. food market
2. central park
3. daycare/school
4. retail
5. nightshelter
6. hostel
7. skills workshop

Design Results

View from outer shopping street



Design Results

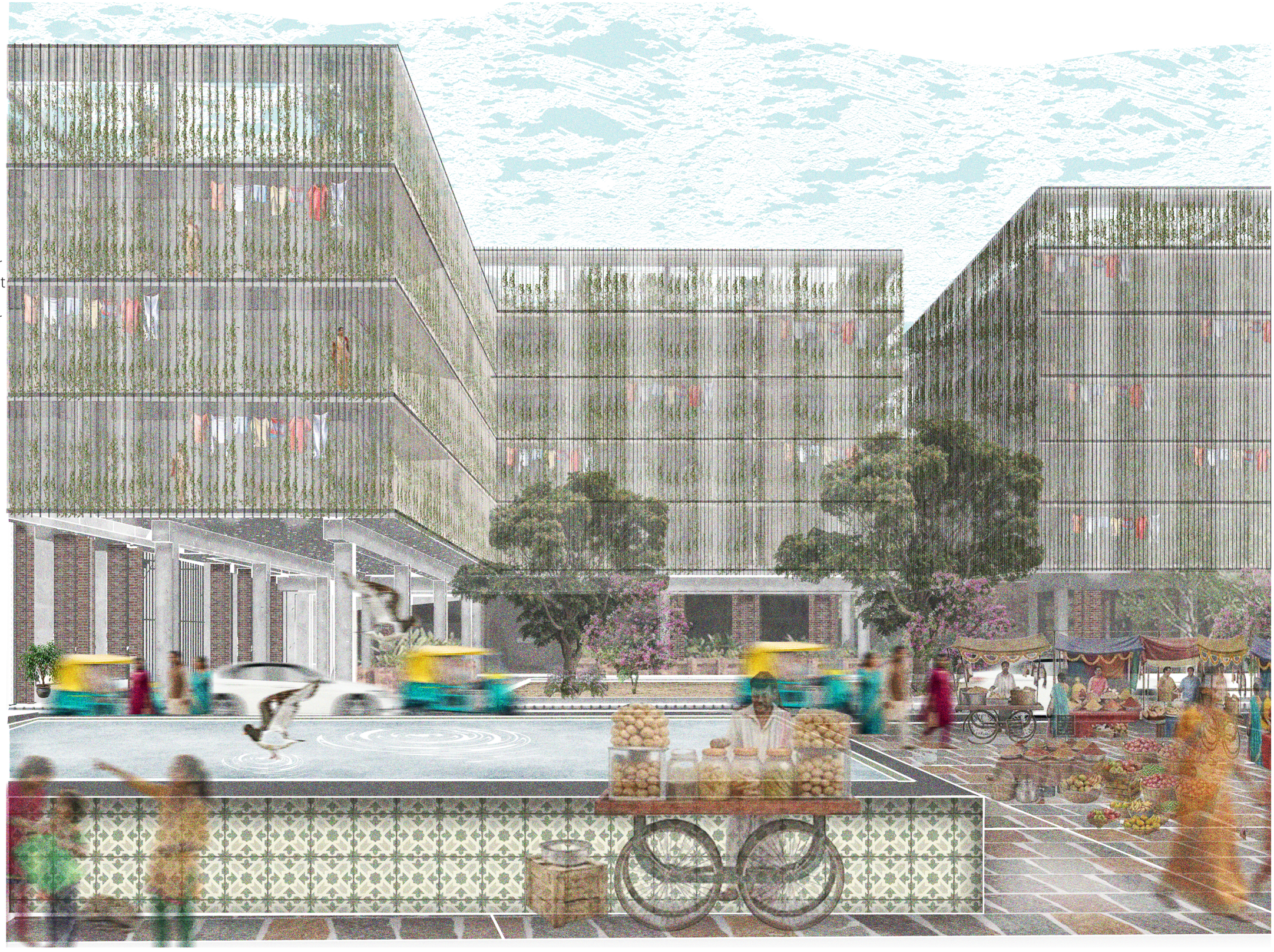
The large central green area, or Maidan, acts as the primary collective space of the project and reflects the hierarchy of communal spaces identified during the “A Day in the Life of Raju” spatial exercise.
This space can be used for holidays or events.



Render created with use of AI

Design Results

The core of the plot is marked by a square with a water fountain. The water fountain collects water during the monsoon season and while the water gradually evaporates during hot months. Surrounding this water fountain, a food market is placed, bringing all social classes together in the hearth of the plot.



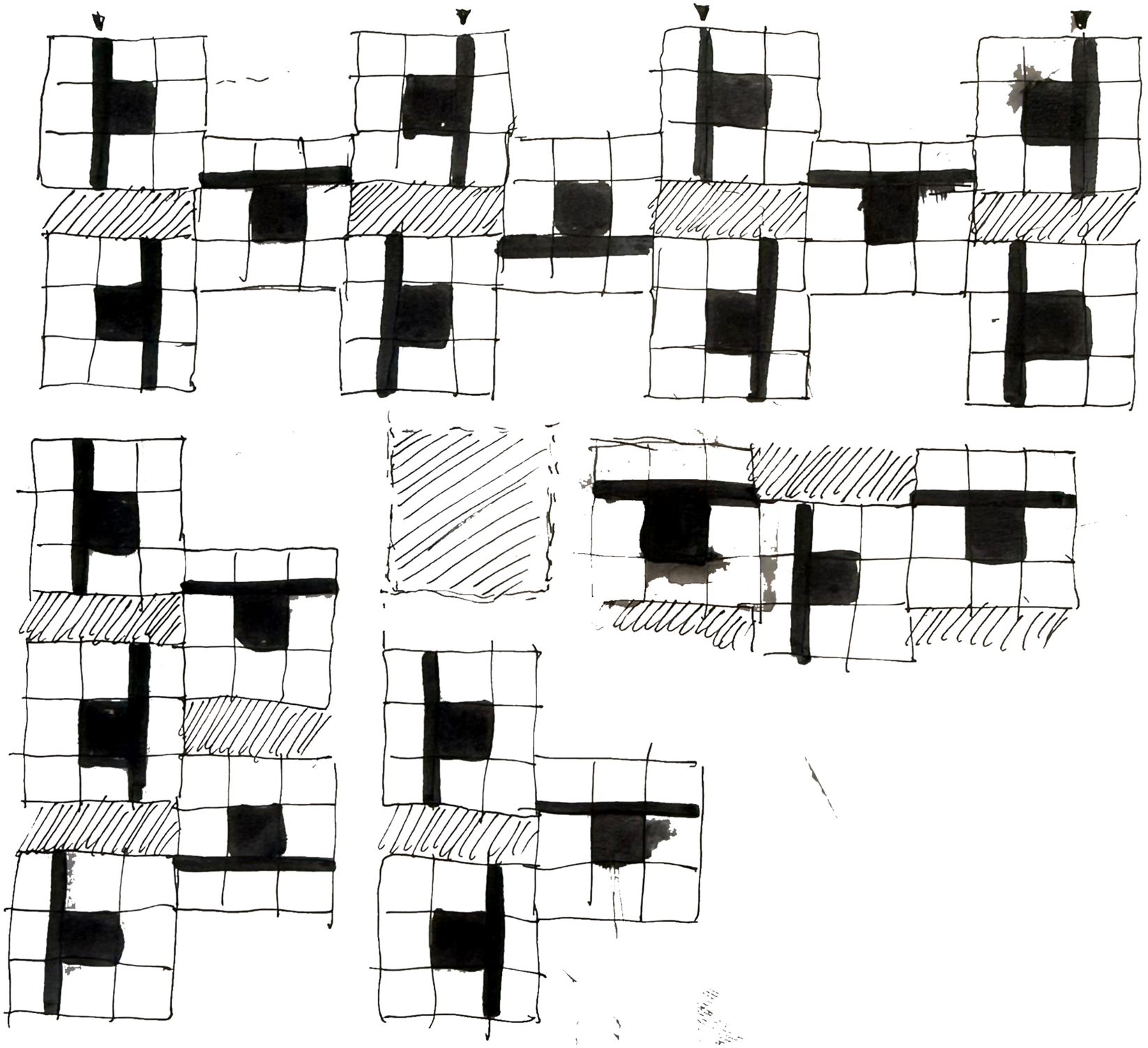
Design Results

Inner street shopping facade



Design Results

At the ground floor level tunnels were created going through all buildings creating passages. The tunnels guide the visitor through the plot, leading to the hearth of the neighborhood. These tunnels create ventilation on the ground floor, ensuring that density does not threateb livability. The tunnels measure 5 m in height, ensuring enough air flows throught the entire plot.



Design Results

Parking infrastructure is strategically integrated beneath the HIG, MIG, and LIG buildings, preserving the ground level for pedestrian movement and communal activities. Beneath the social housing structures, however, the lower levels accommodate hostels and night shelters instead of private parking. This spatial prioritization reflects the social agenda of the project by allocating the most accessible spaces to the most vulnerable user groups rather than prioritizing automobiles.

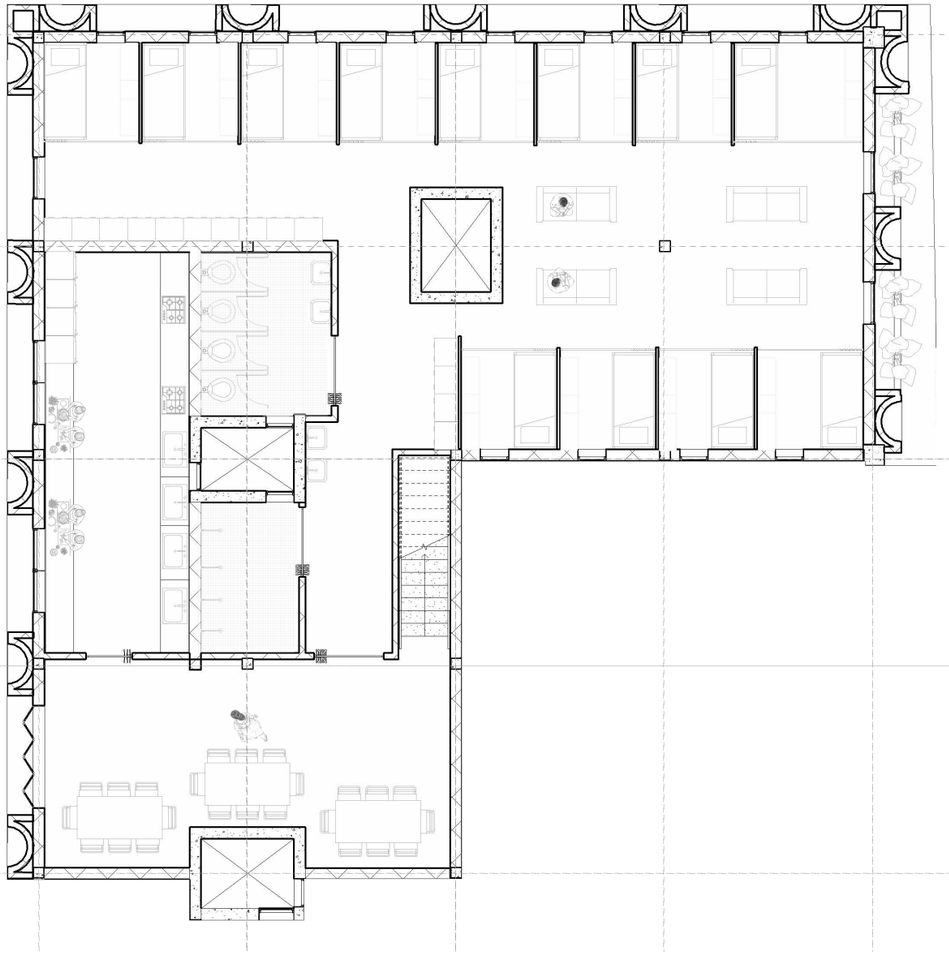
The proposal accommodates multiple migrant typologies identified in the research framework. Circular migrants are supported through highly flexible night shelters positioned beneath the social housing structures. Separate shelters for men and women provide immediate access to sanitation, storage, and temporary sleeping facilities for workers with highly mobile living patterns. Seasonal migrants are accommodated within hostel units that provide medium-term housing solutions for workers staying in Ahmedabad for several months. Long-term migrant families are housed within expandable social housing units designed around the "Seed Unit" strategy.

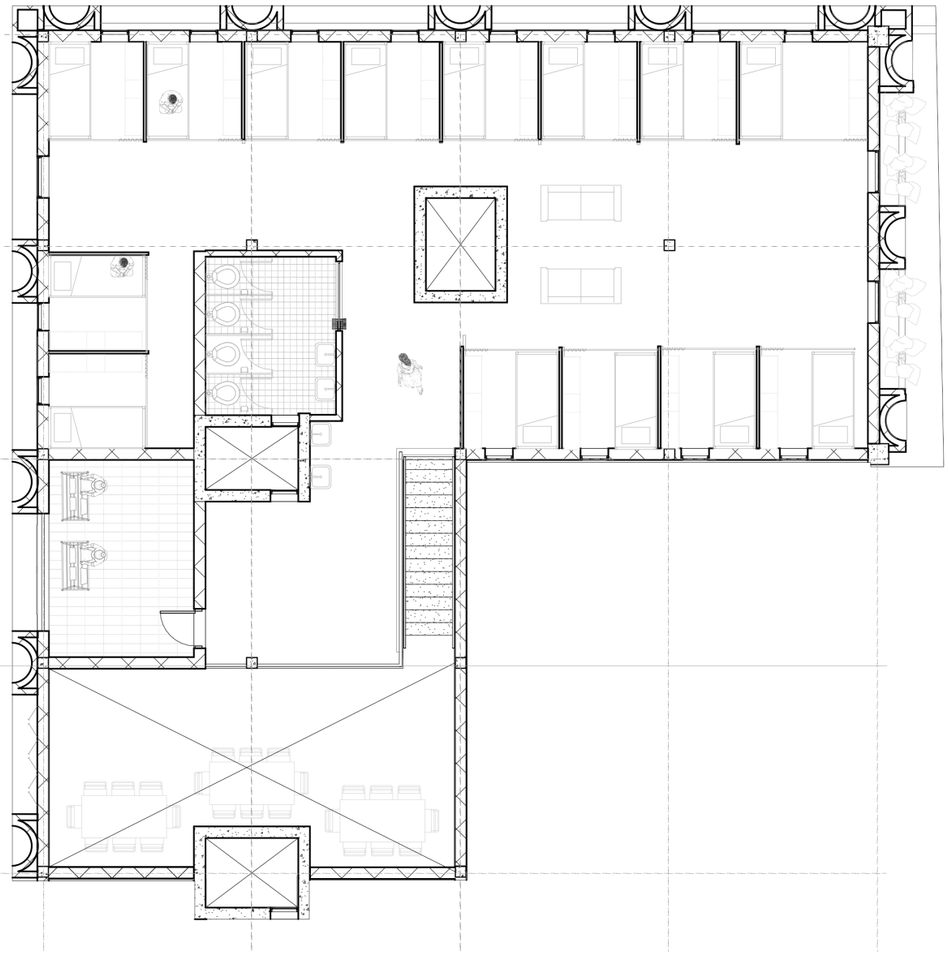
1. food market
2. central park
3. daycare/school
4. retail
5. nightshelter
6. hostel
7. skills workshop

Design Results

Nightshelter

The nightshelter houses 52 people. There are 2 nighshelters placed at opposite parts of the plot, one for males and one for females. The female nightshelter is placed at the West side close to the metro station for immediate access and incresed sense of security. Each nightshelter has a cooking area, two toilets and two bathing rooms, one at the ground floor and one at mezzanine level. At the ground floor there is a dining area as well. Each sleep space is shared among two people and features its own window, a bunked bed, storage space and a curtain for privacy.



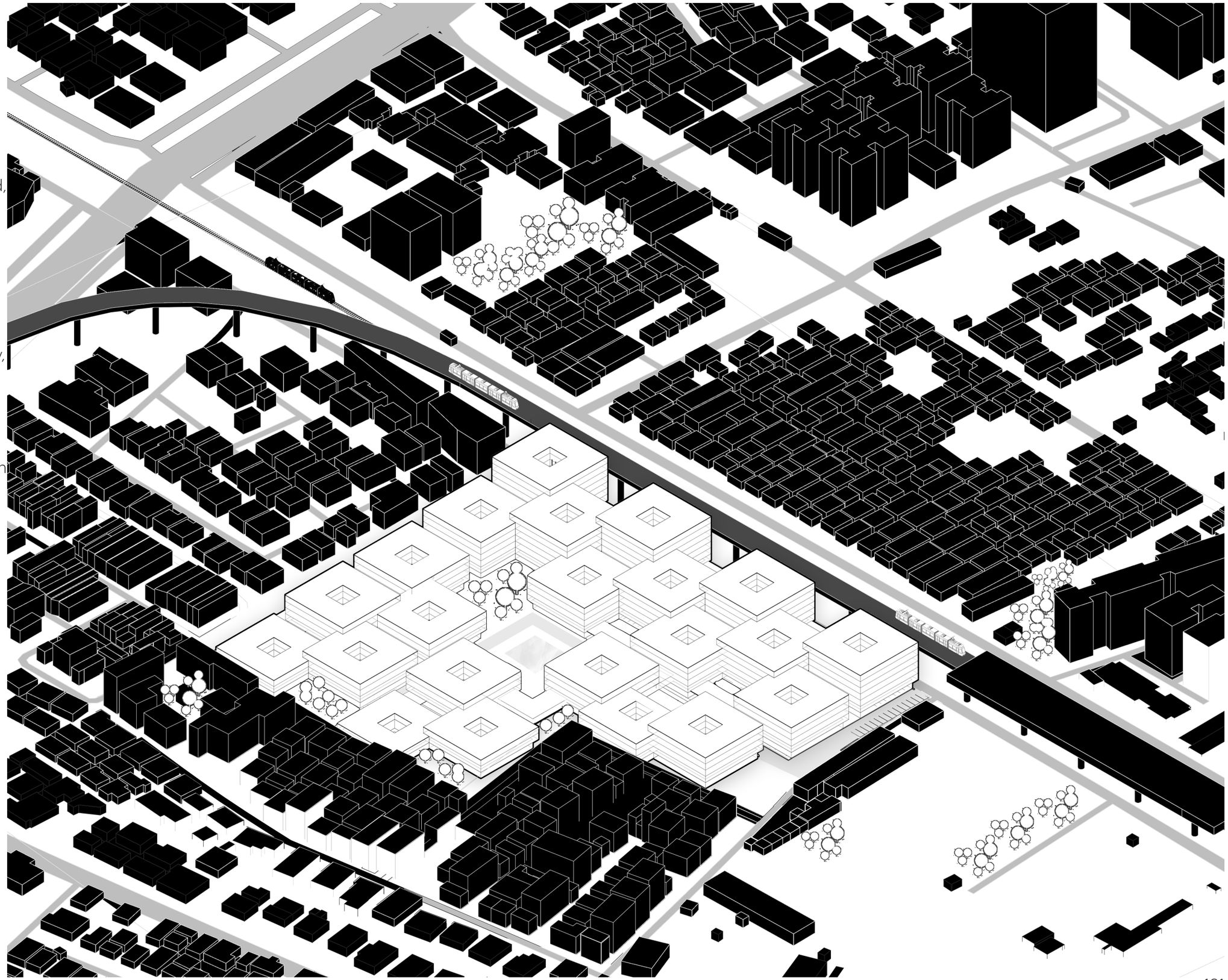




Nightshelter
52 people
2 units

Design Results

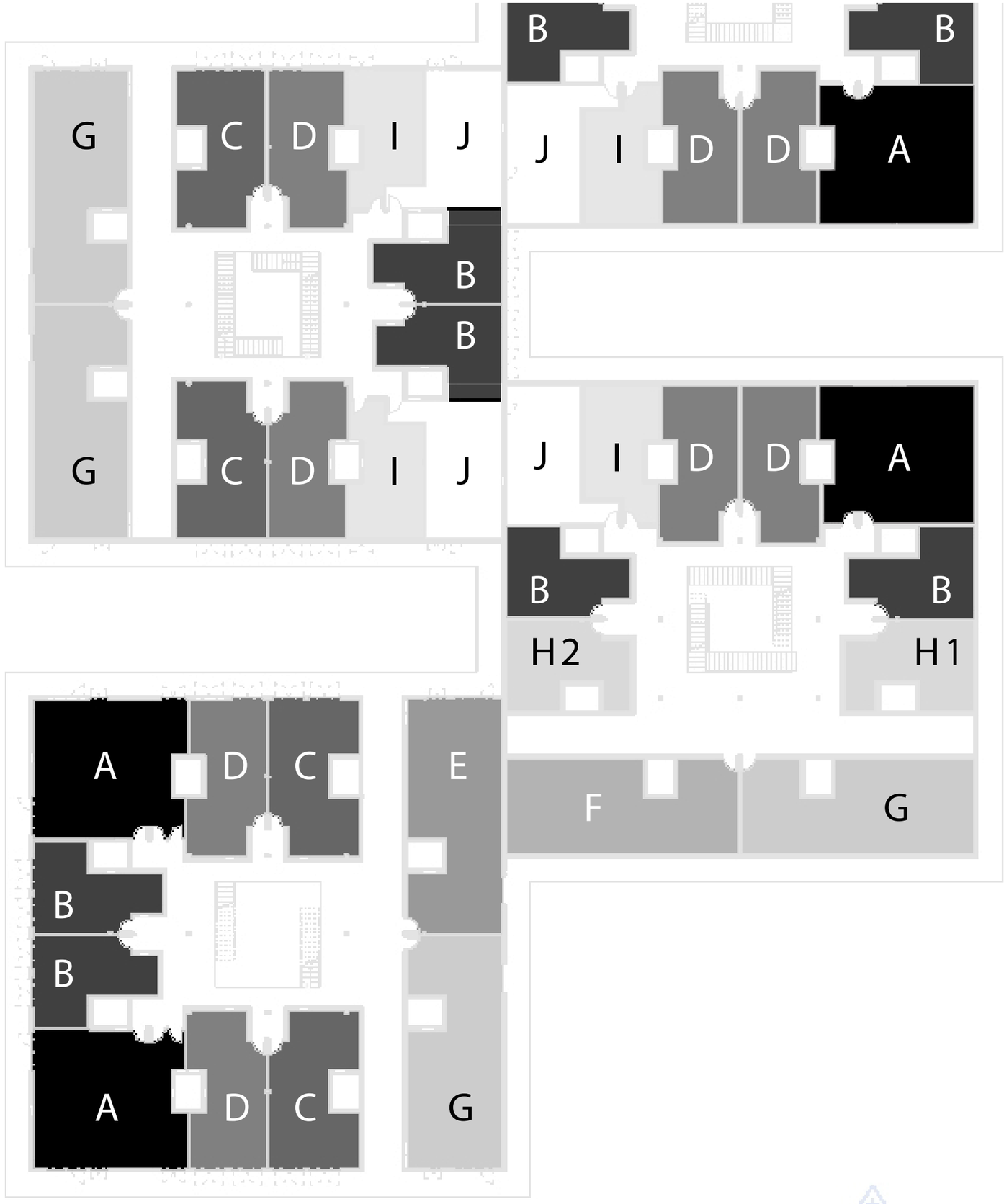
The project rejects the isolated tower typology characteristic of many BSUP resettlement colonies, where repetitive stand-alone blocks produced social alienation and spatial segregation (Salmi, 2019). Instead, the buildings operate as a continuous mat-building system, where individual structures are physically interconnected through circulation networks, terraces, and communal open spaces. This strategy creates a horizontally distributed urban fabric that prioritizes permeability, connectivity, and gradual transitions between public and private space. The mat-building approach also supports the theoretical position that architecture should function as an adaptable framework rather than a static product (Turner, 1976; Habraken, 1961).



Design Results

Cluster 1



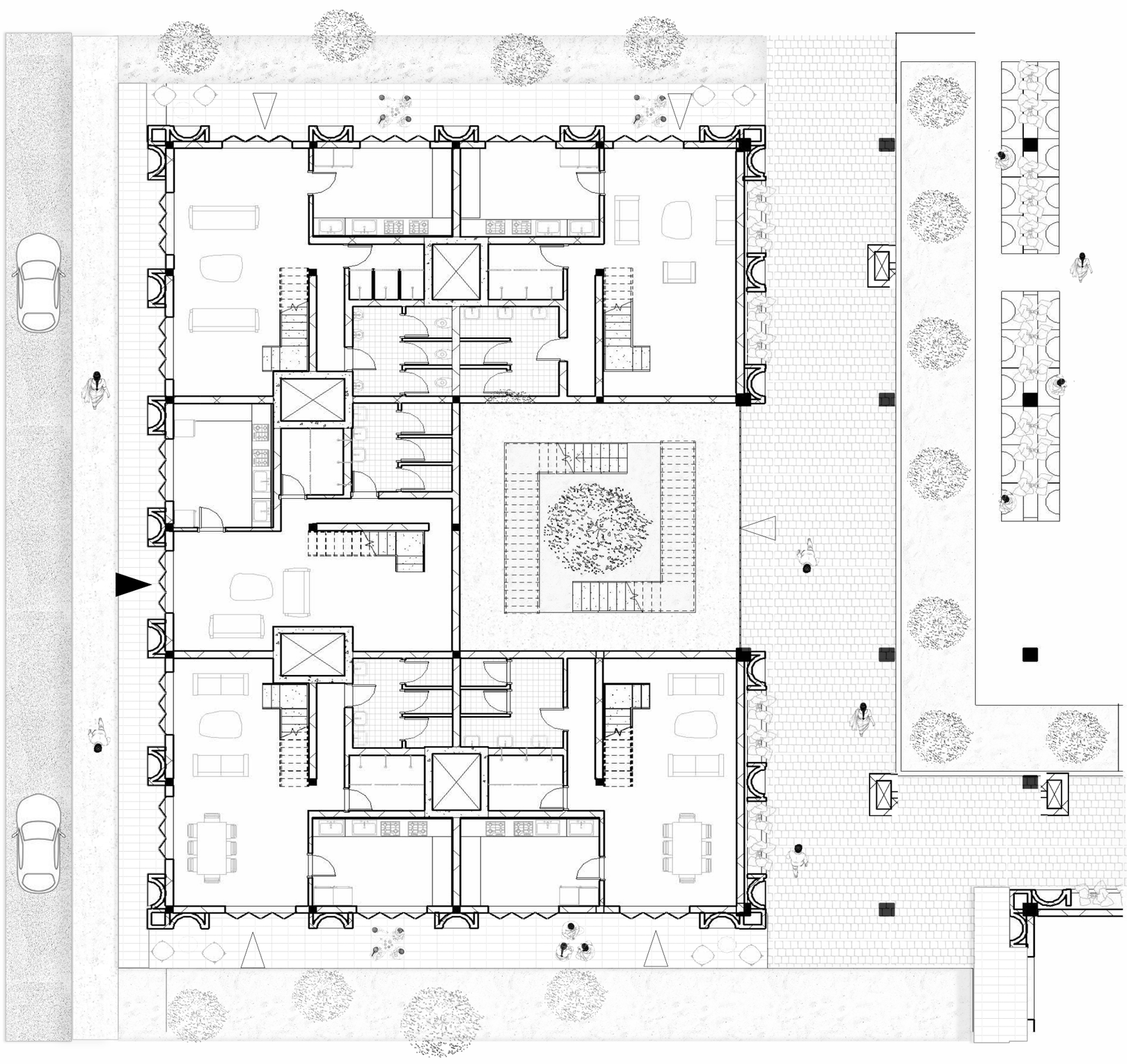


Design Results

Social Housing Typical Building layout - Ground floor

The ground floor typically accomodates hostel units and a large circulation space that connects all buildings through the so called “tunnels”. This area can be used during hot months when the sun is too strong for the residents to gather on the roof.

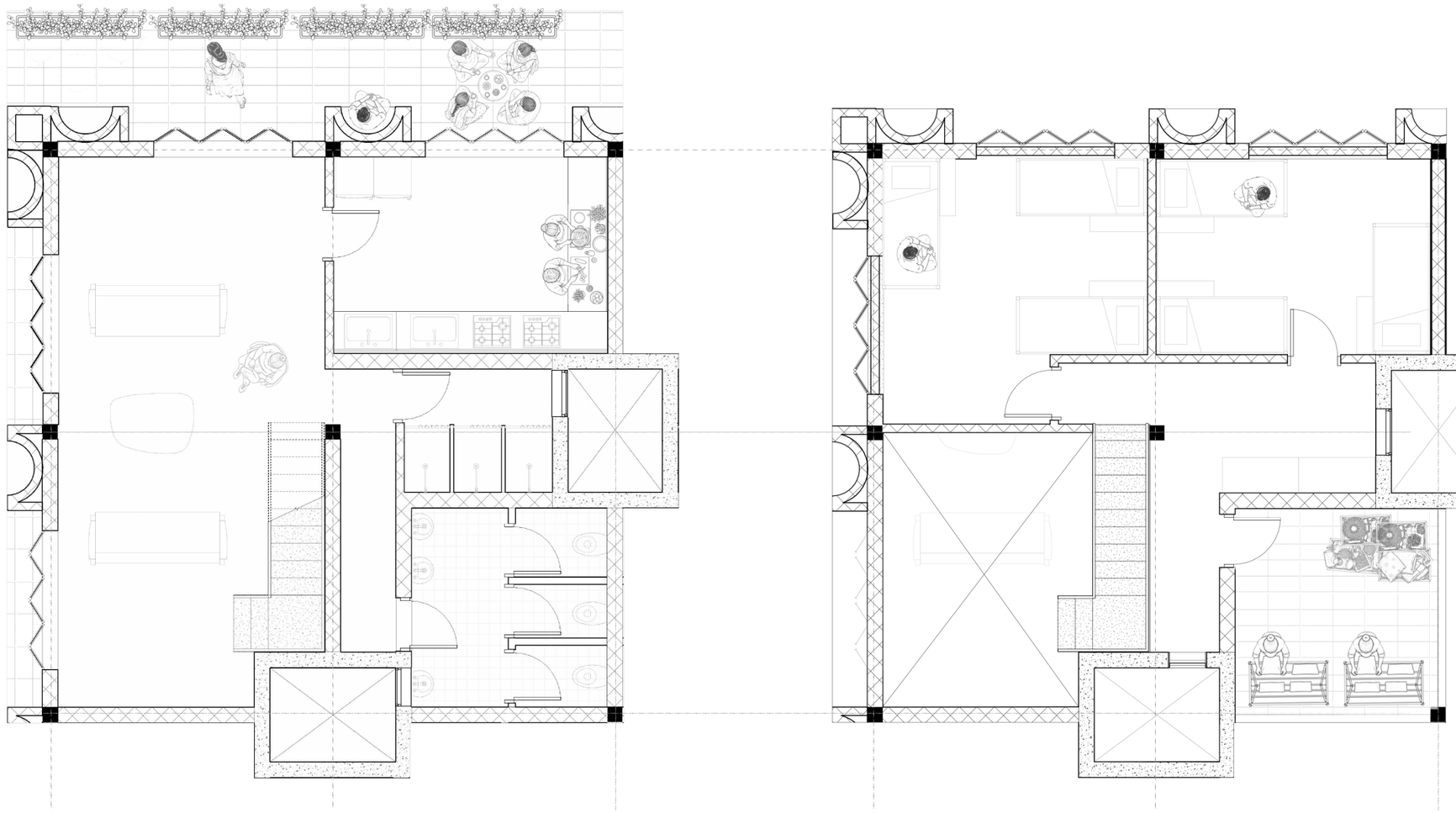




Design Results

Hostel

The typical hostel layout features a ground floor and mezzanine level. At the mezzanine level a cooking area is included as well as a shared bathroom and toilet. A social spot is placed for the residents to interact among each other. The space can open up to the outside through floding doors, allowing users to relax outside as well. At the mezzanine level, there are 2 bedrooms, each accomodating 6 people using bunk beds. There is a balcony as well facing the core of the building, where the circulation is. This balcony is created for the users to be able to dry their clothes or relax if the temperatures outside are too high.





Hostel
12 people
57 units

Design Results

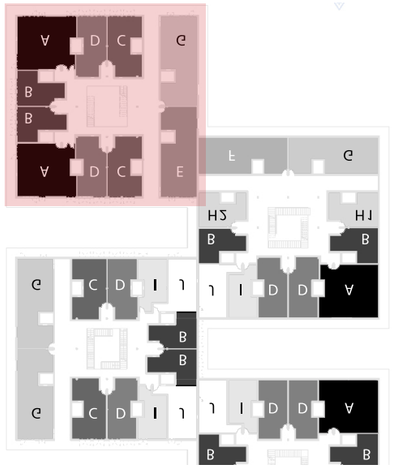
Smaller social spaces are distributed throughout the site between housing blocks, gradually expanding toward the central communal landscape.

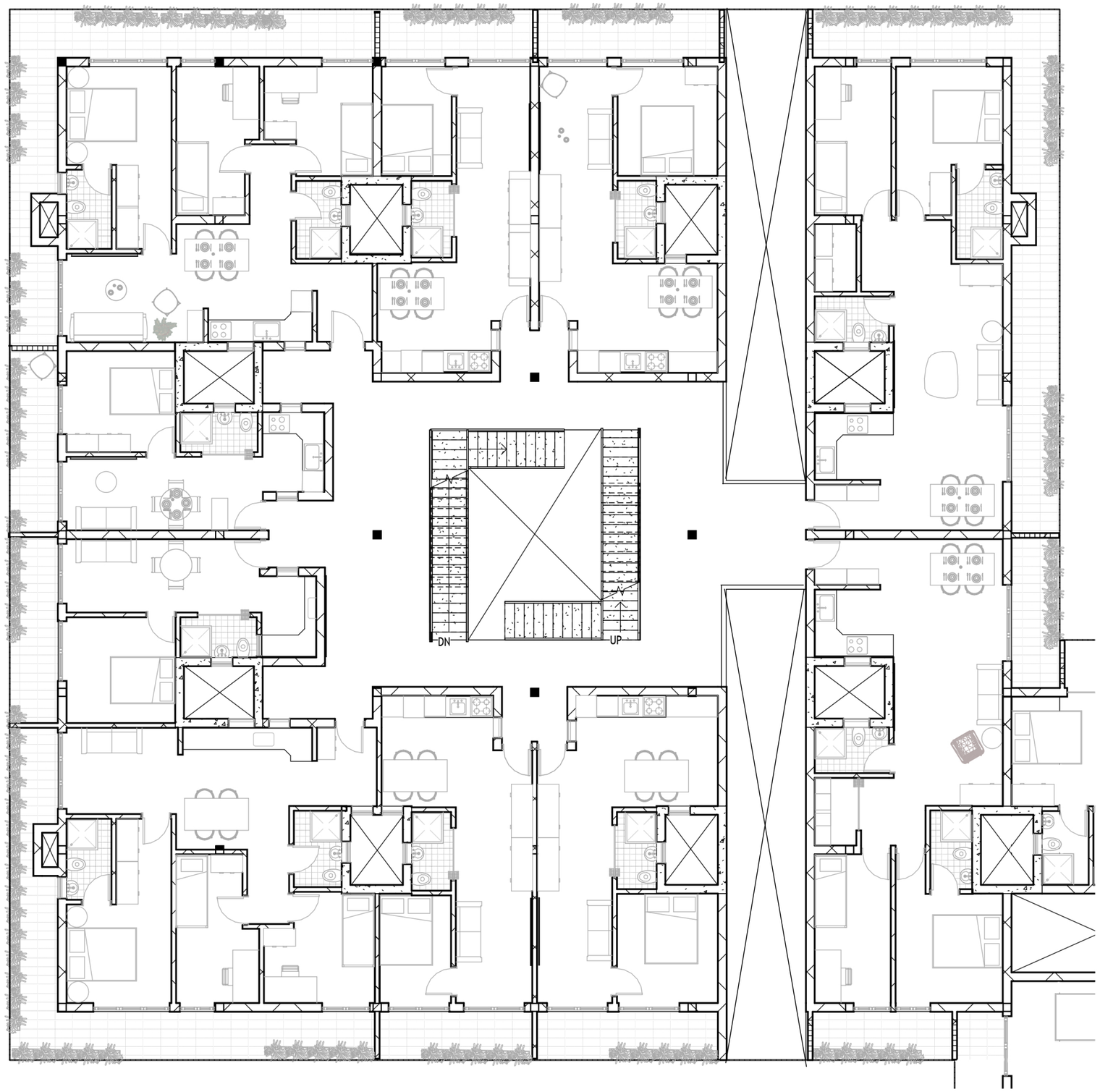
Between every building, open spaces emerge at the ground level, functioning as informal social courtyards where residents can gather, children can play, and neighborhood relationships can develop. These intermediate spaces recreate the “eyes on the street” condition that was lost in vertical resettlement housing projects (Jacobs, 1961; Salmi, 2019).



Design Results

Social Housing Typical Building layout - First floor





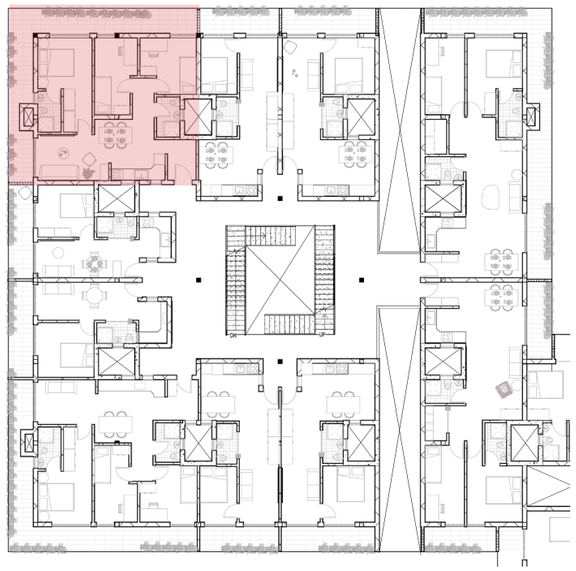
Design Results

Social and low income dwellings

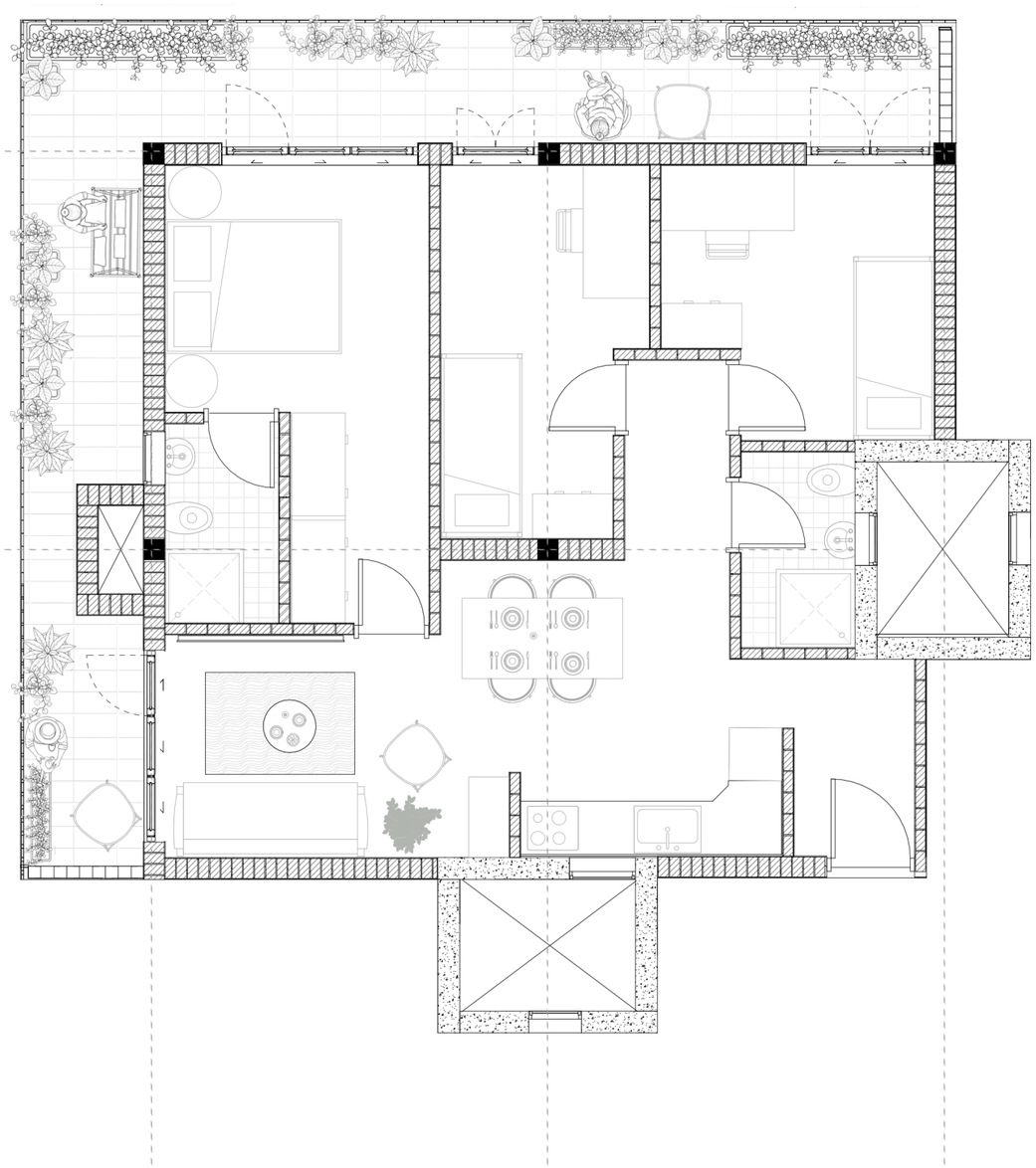
There are 4 dwelling typologies that have 2 bedrooms. These typologies range from 67 square meters to 71 square meters.

The 67 square meter apartments feature one large bedroom and a smaller one. The large bedrooms have their own bathroom.

The 71 square meters apartment has 2 large bedrooms, one having its own bathroom.



Type A
71sqm.
52 units



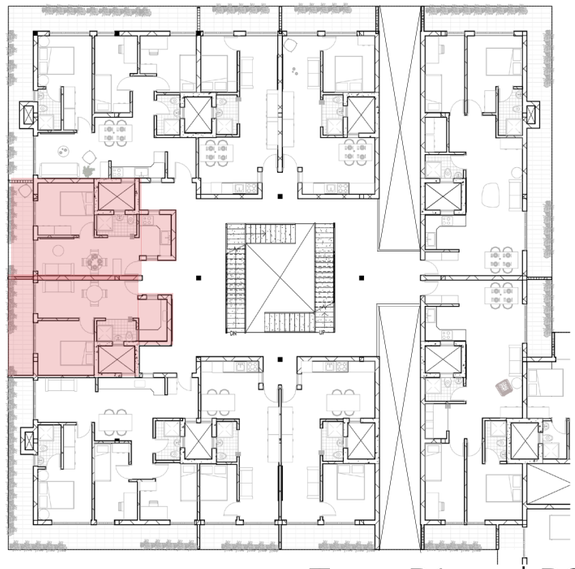
Design Results

Social and low income dwellings

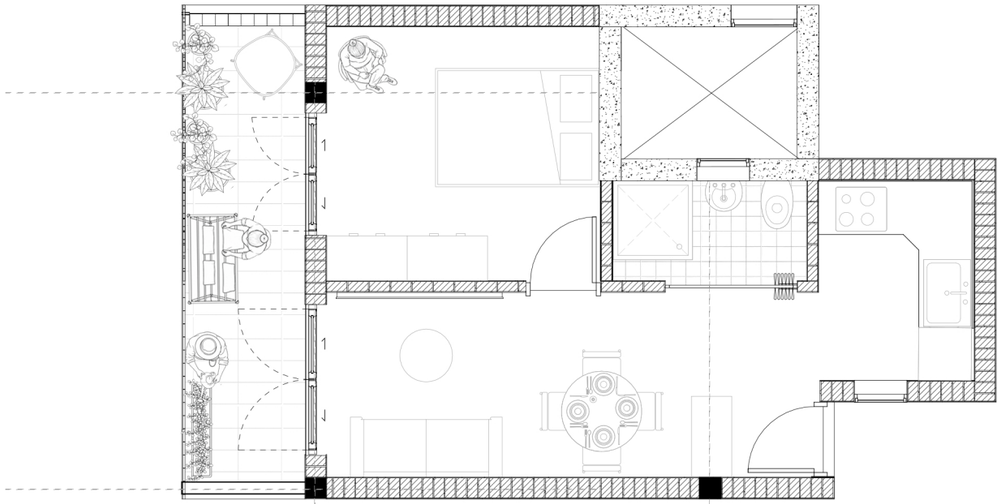
There are 8 social and low income dwelling typologies that feature 1 bedroom.

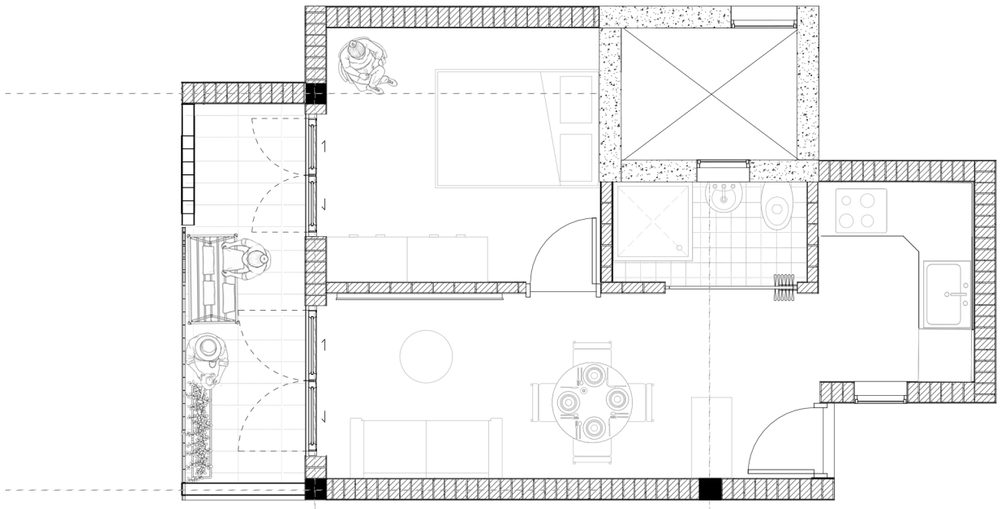
These typologies range in sizes from 28 sqm. to 35 sqm.

The apartments feature a bathroom, living room, kitchen and a bedroom as well as a balcony.



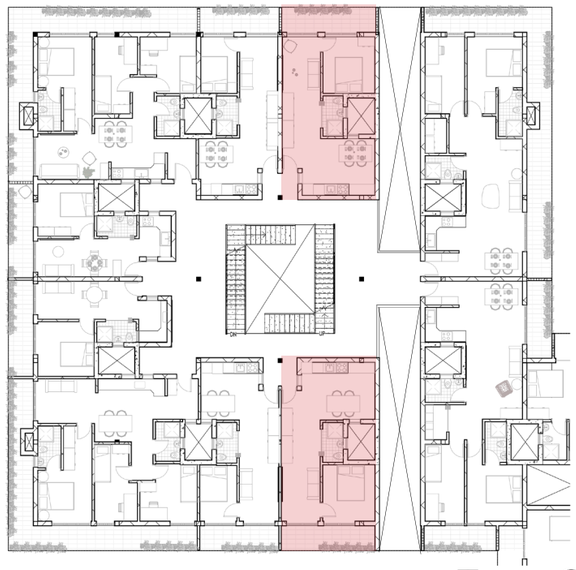
Type B1 and B2
28 sqm.
92 units



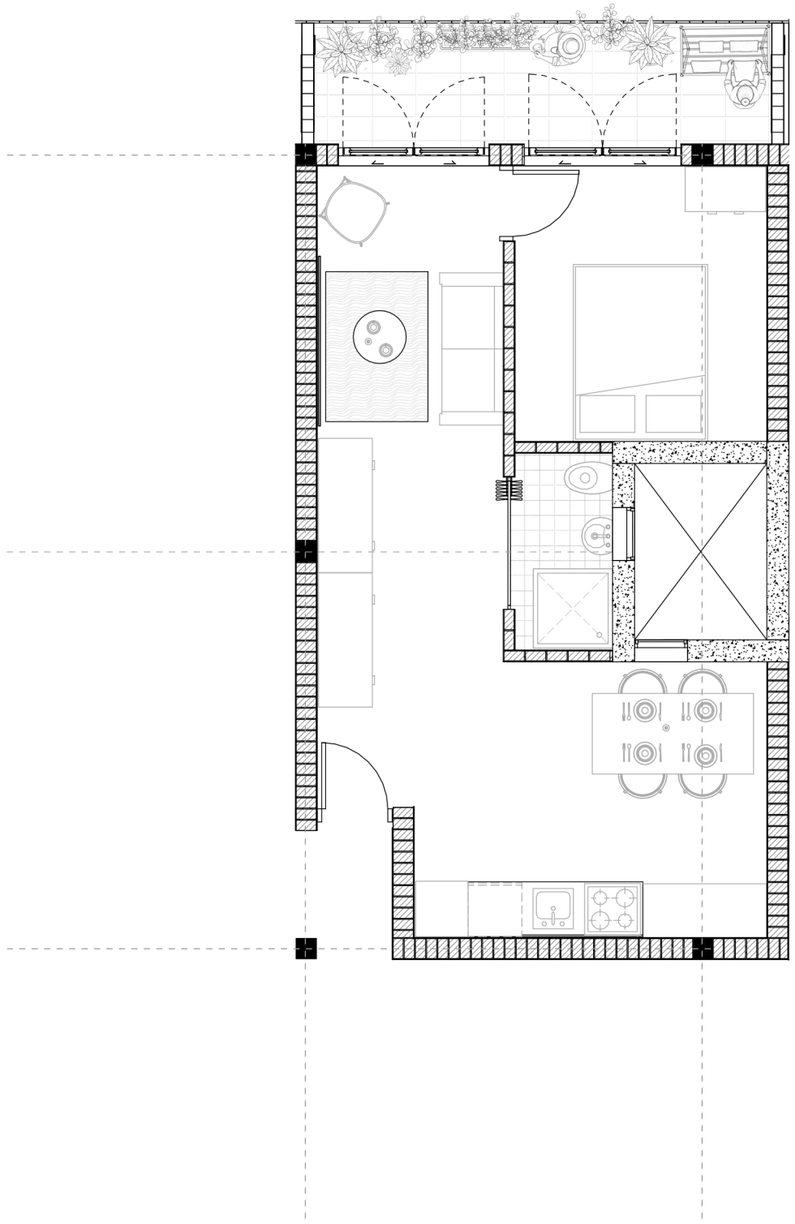


Design Results

Social and low income dwellings

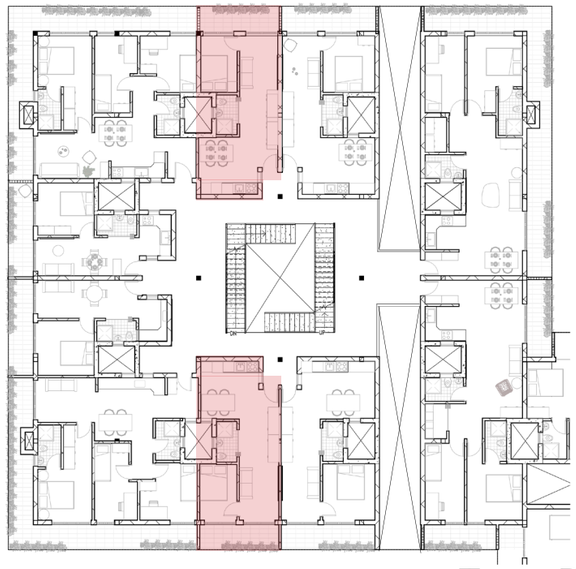


Type C
40 sqm.
17 units

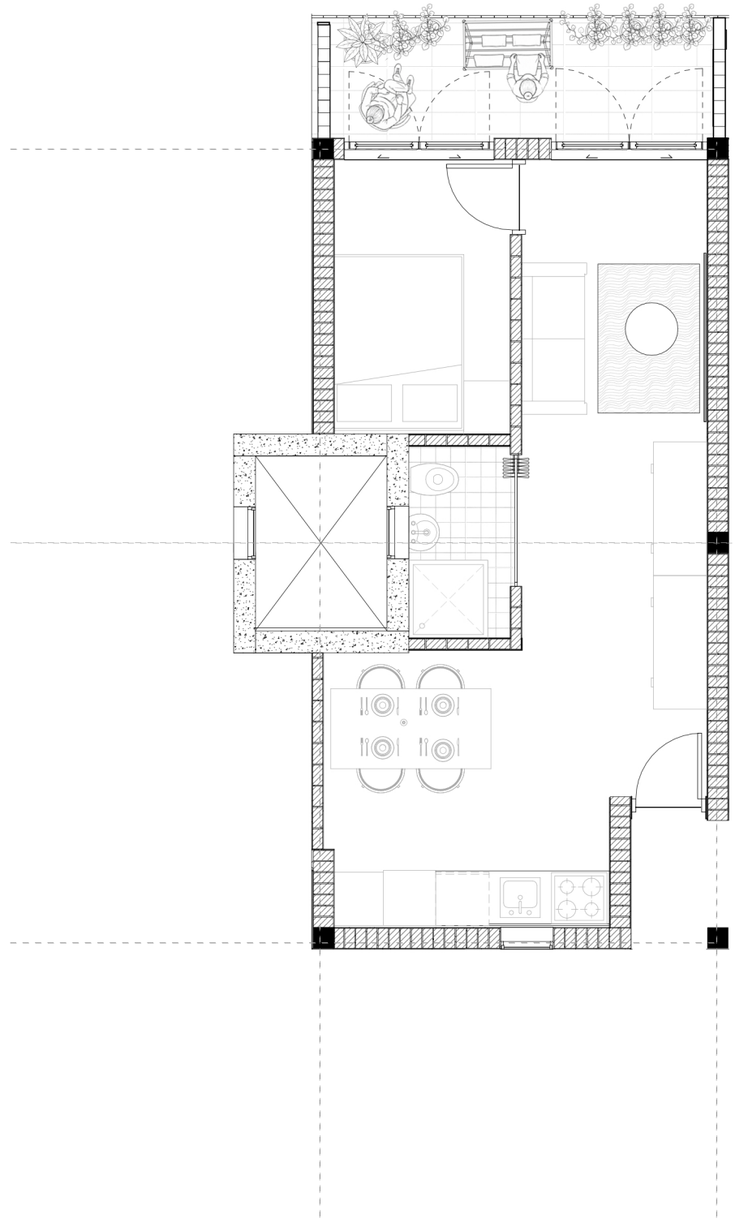


Design Results

Social and low income
dwellings

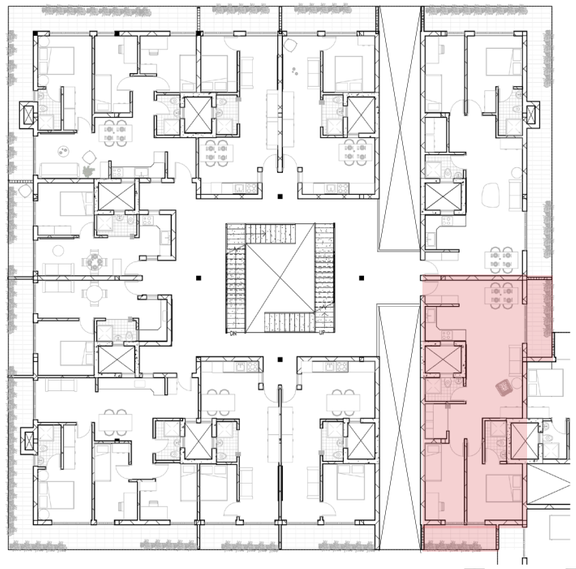


Type D
36 sqm.
89 units

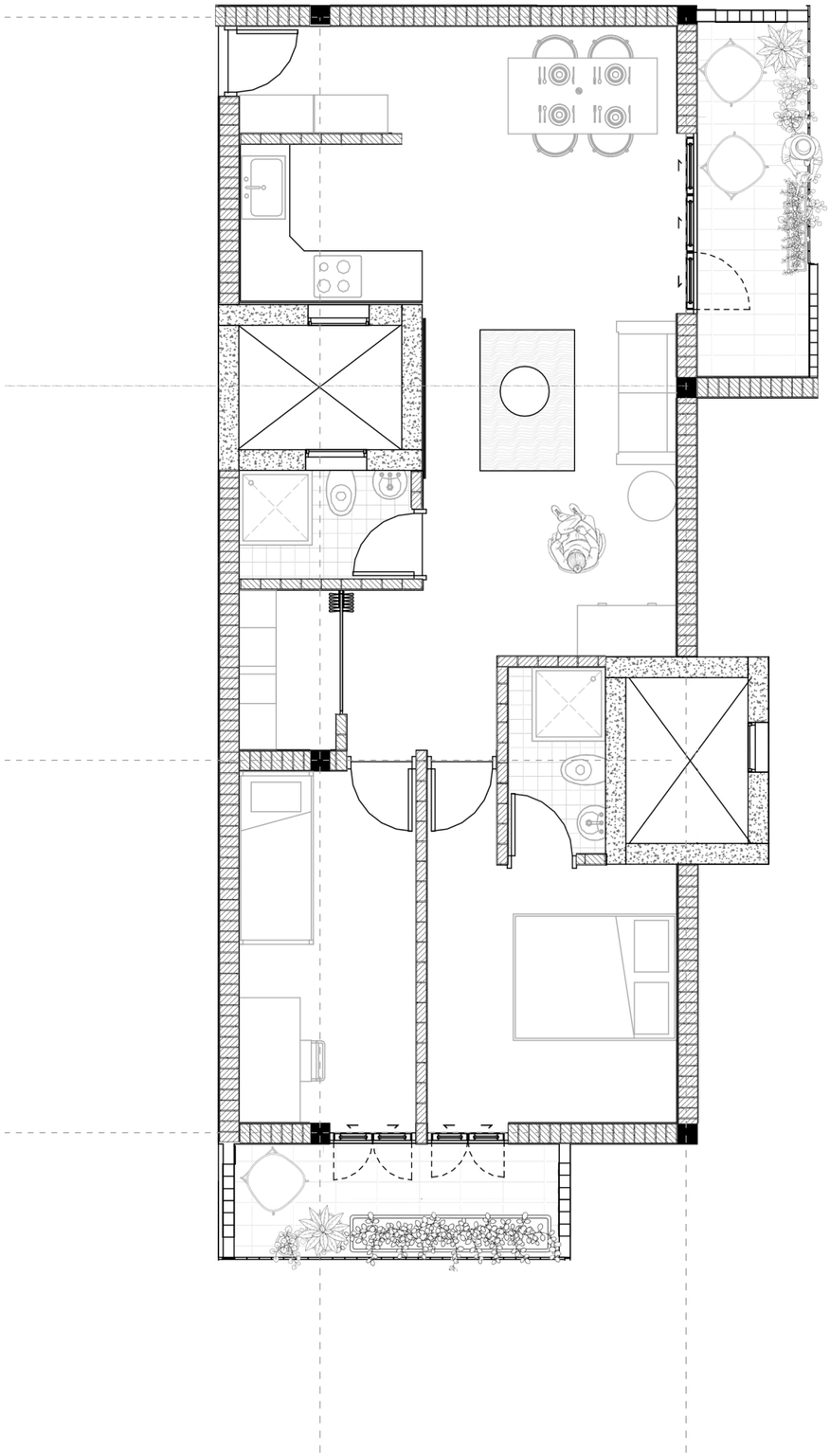


Design Results

Social and low income dwellings

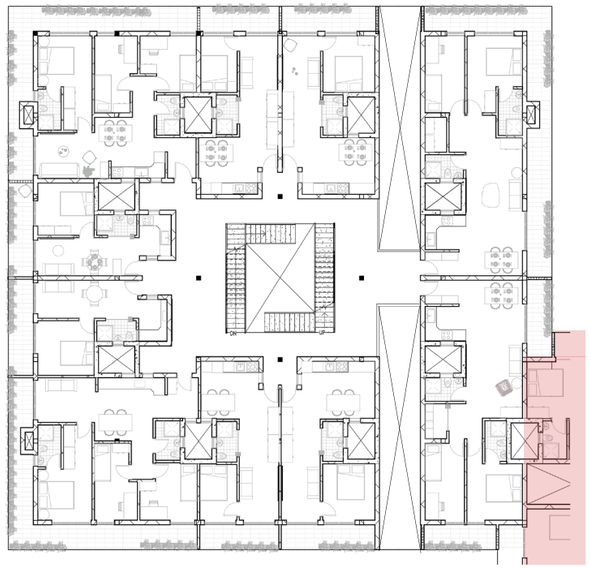


Type E
67 sqm.
7 units

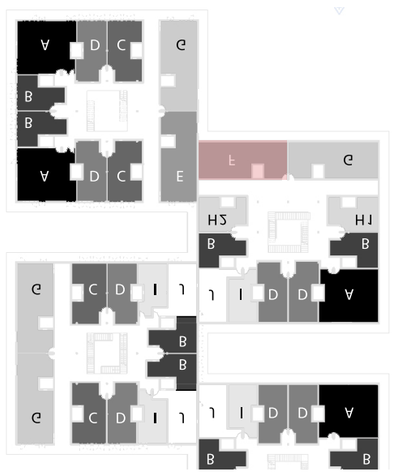


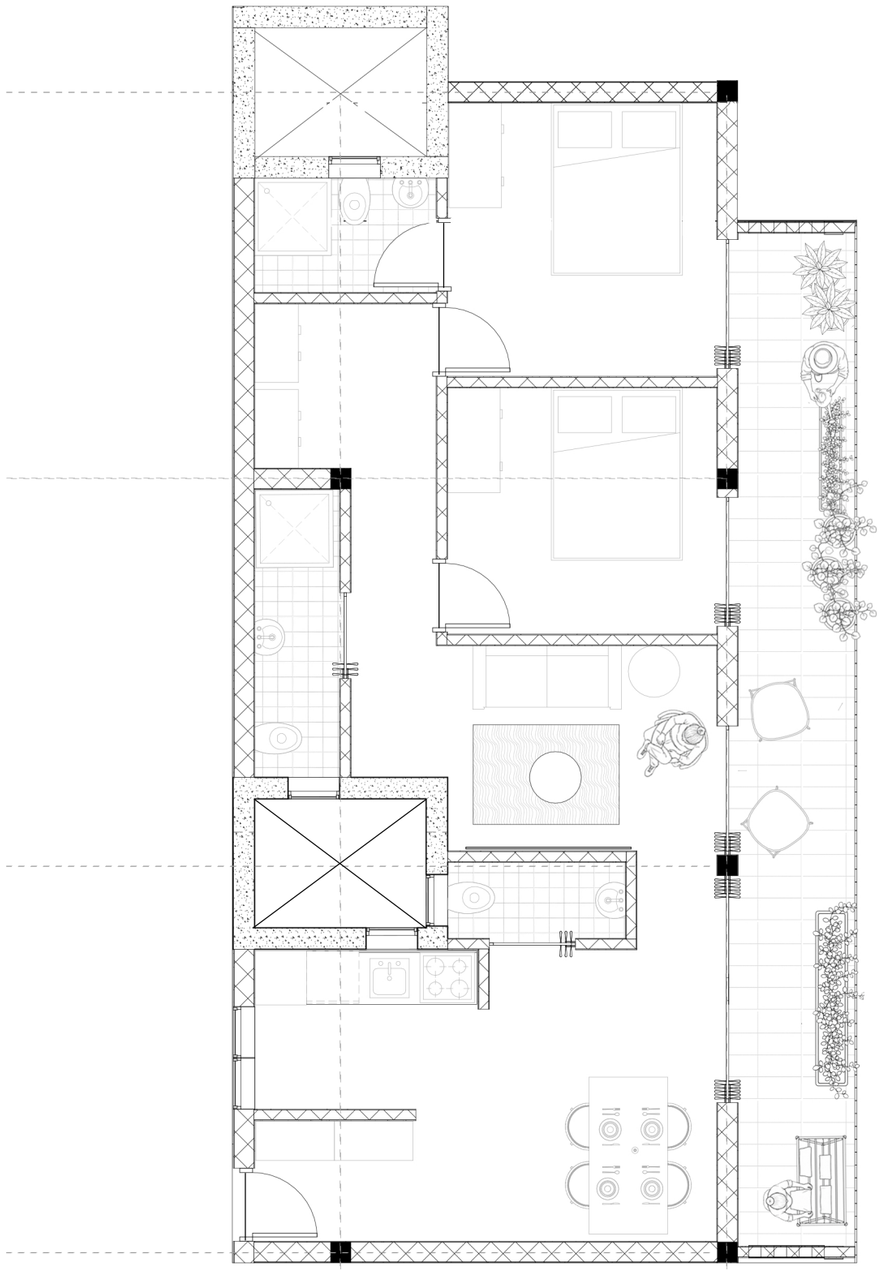
Design Results

Social and low income dwellings



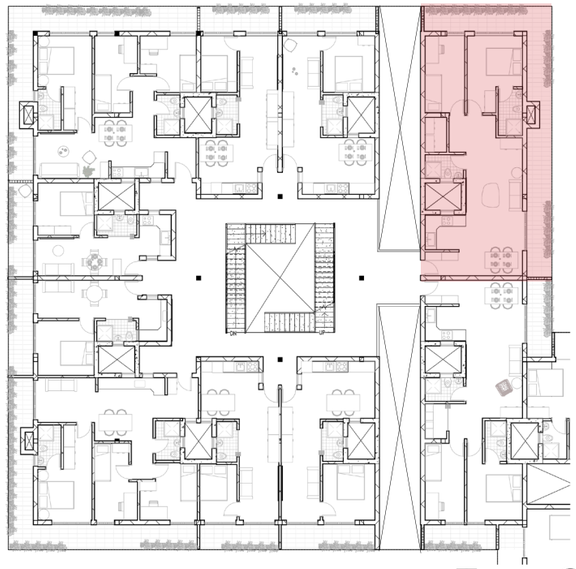
Type F
67 sqm.
3 units



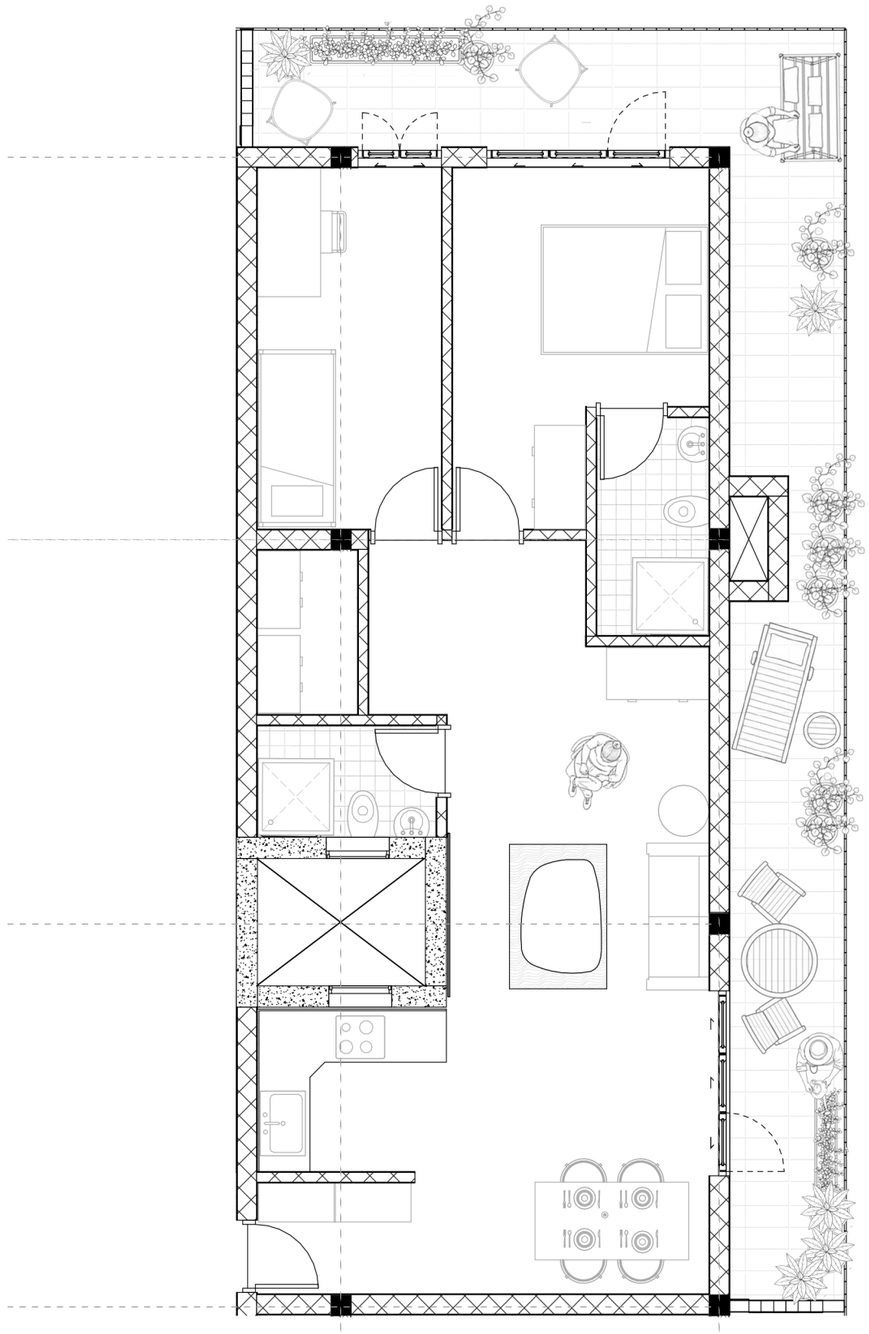


Design Results

Social and low income
dwellings

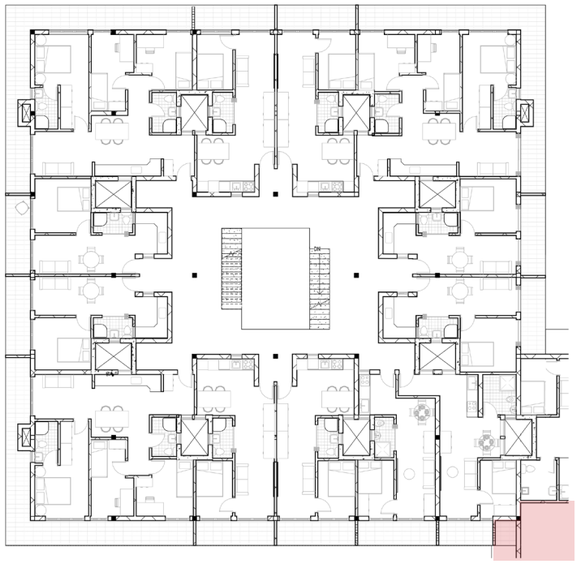


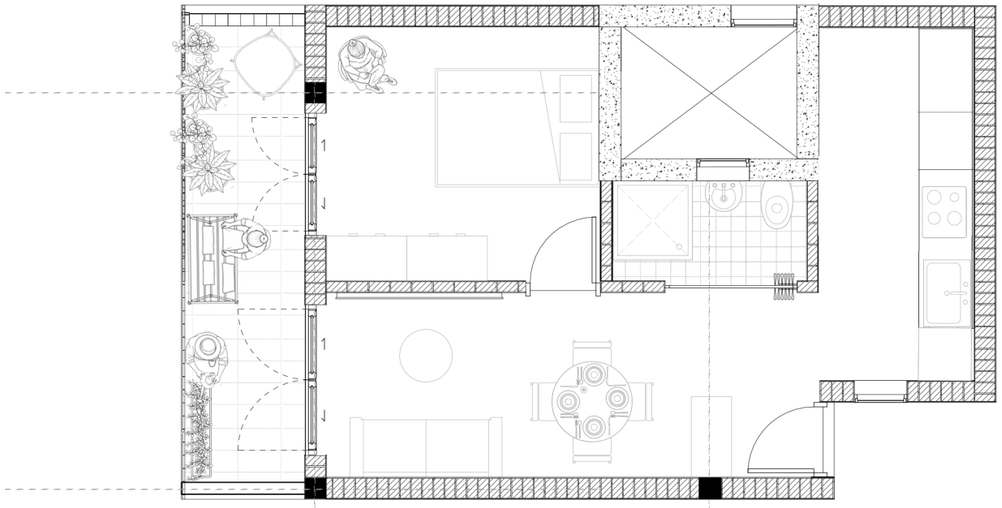
Type G
67 sqm.
17 units



Design Results

Social and low income dwellings

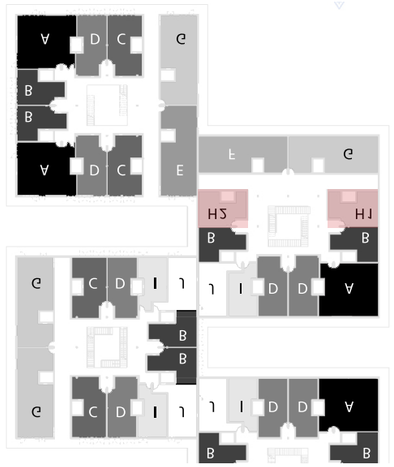


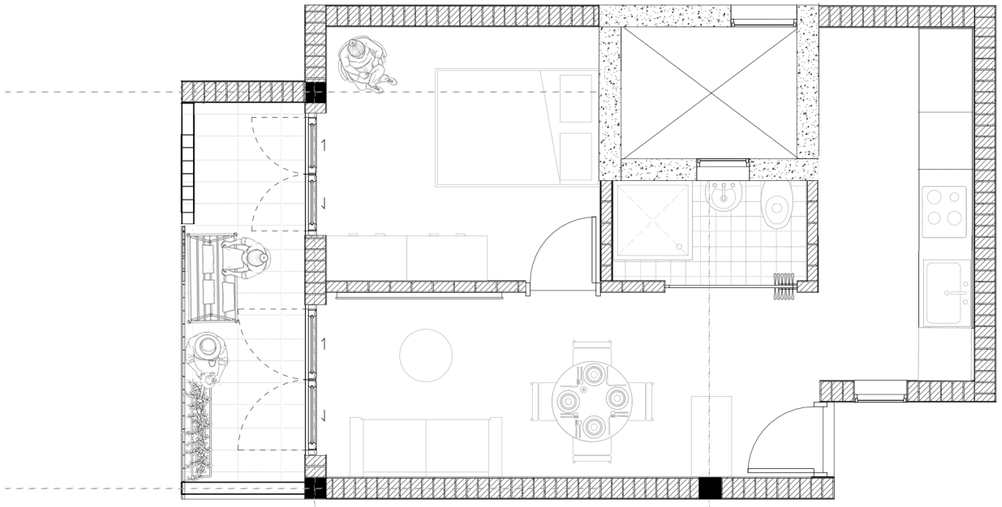


Type H1 and H2

28 sqm.

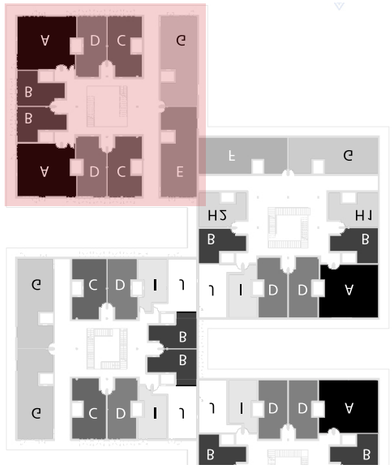
10 units

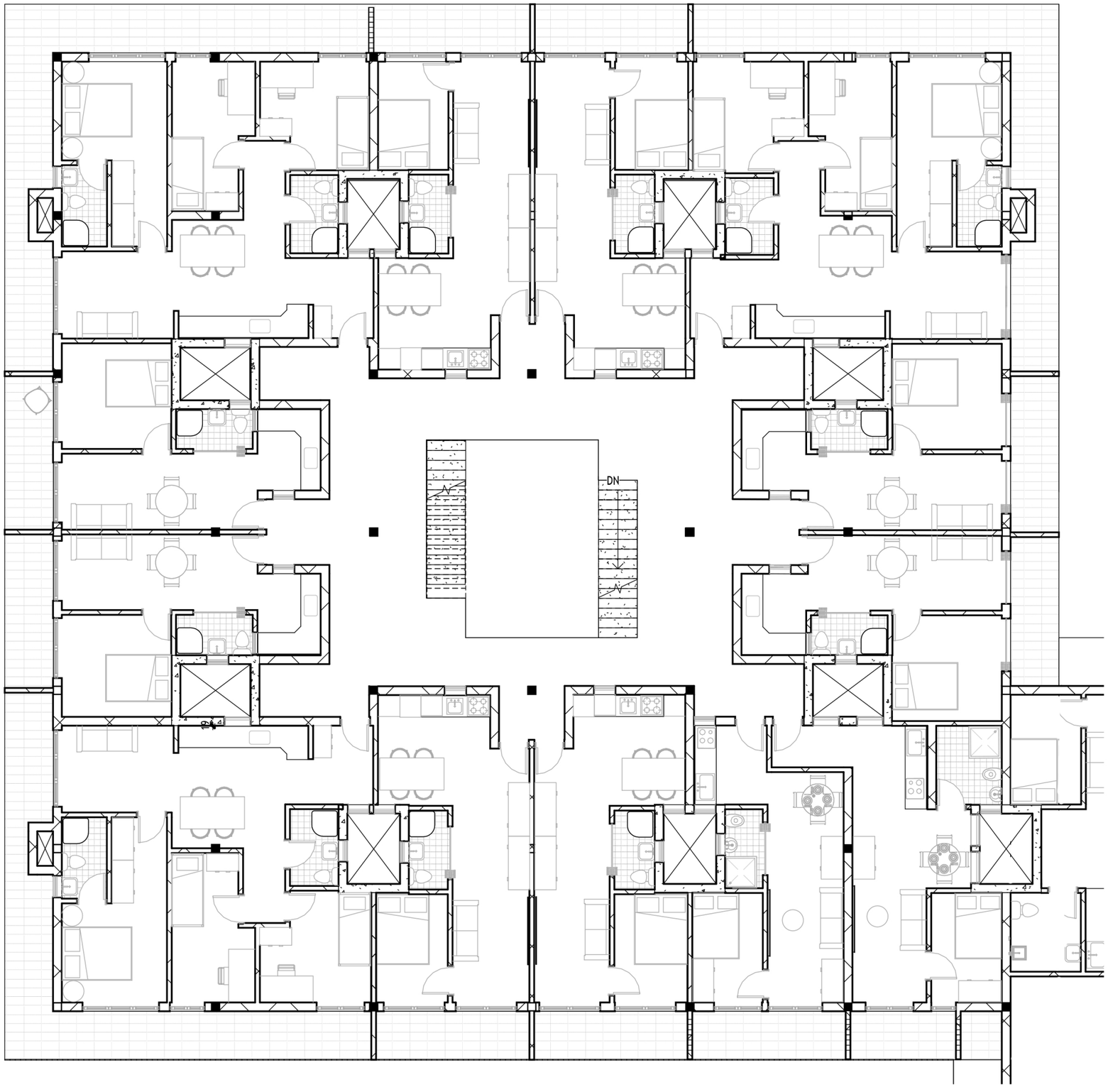




Design Results

Social Housing Typical Building layout - +Second floor



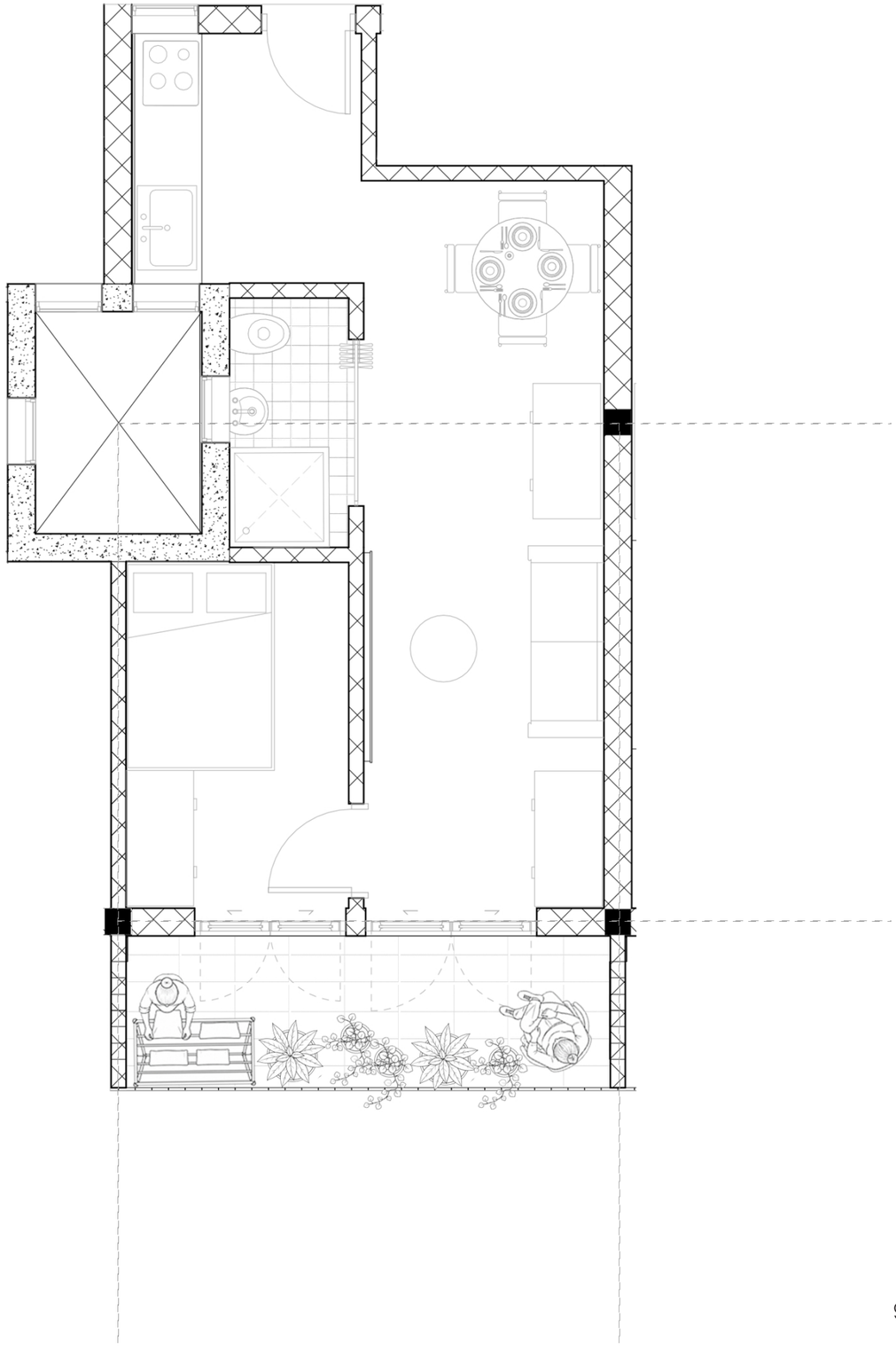


Design Results

Social and low income dwellings

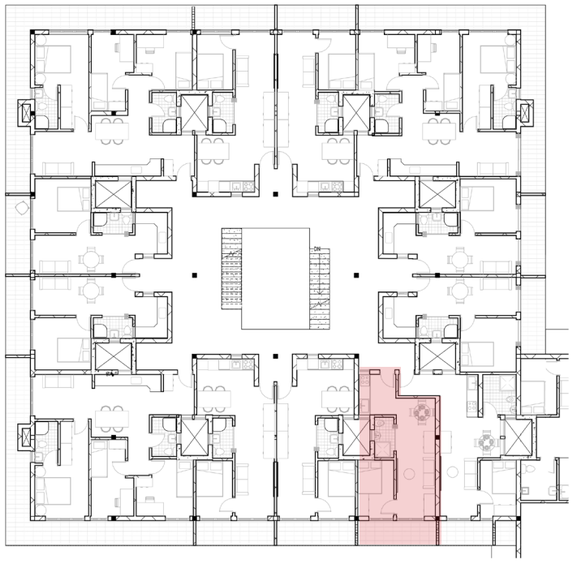


Type I
28.5 sqm.
30 units

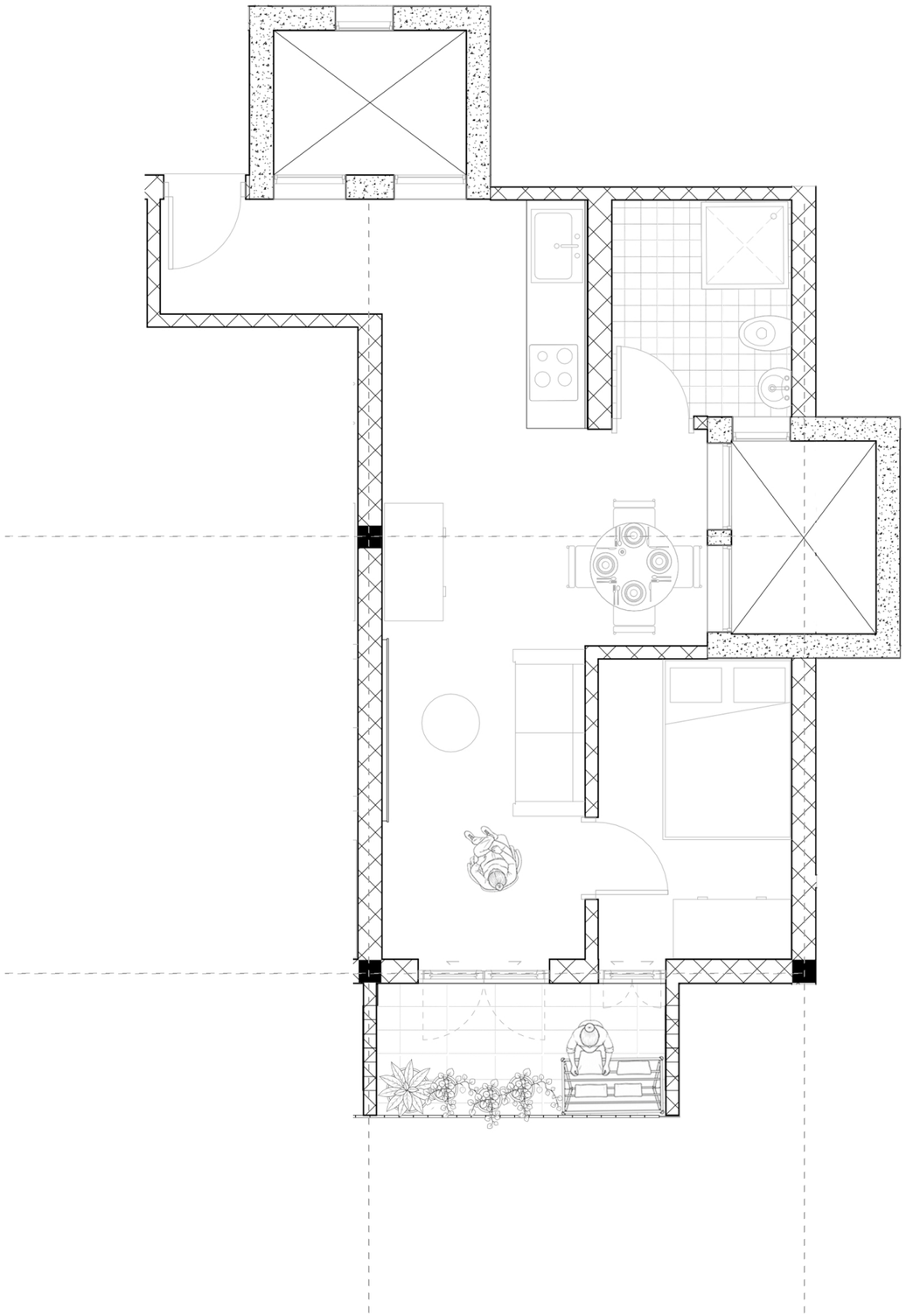


Design Results

Social and low income dwellings

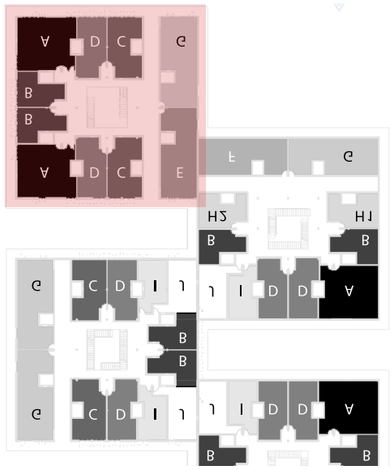


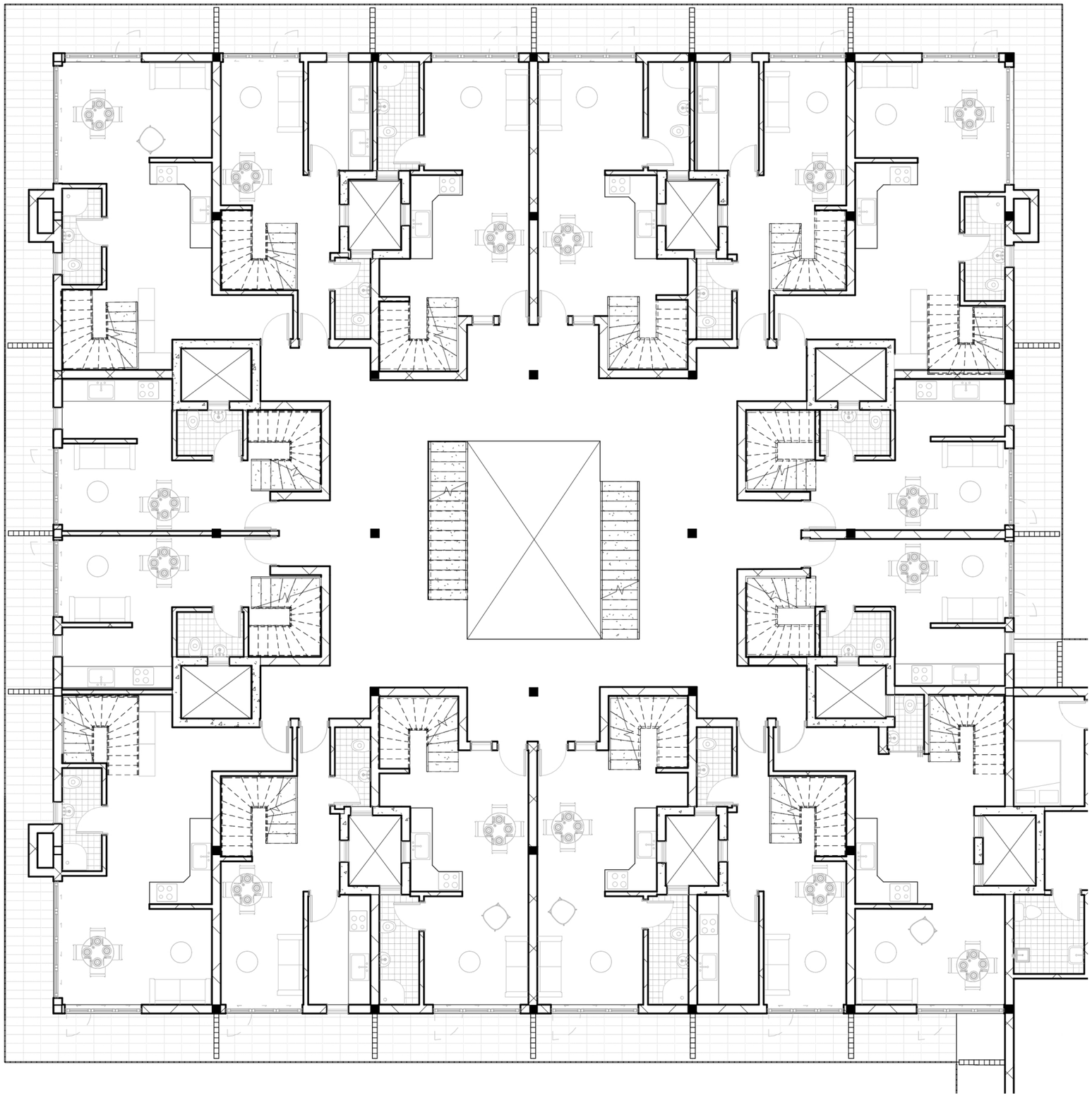
Type J
35 sqm.
30 units



Design Results

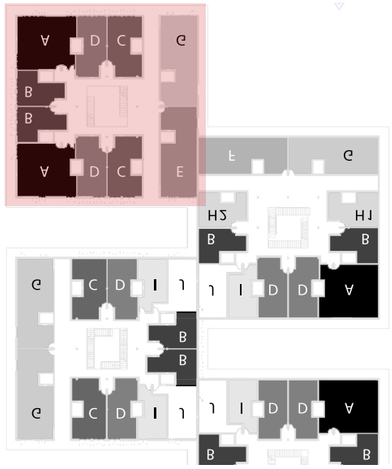
Social Housing Typical Building layout - Third Floor

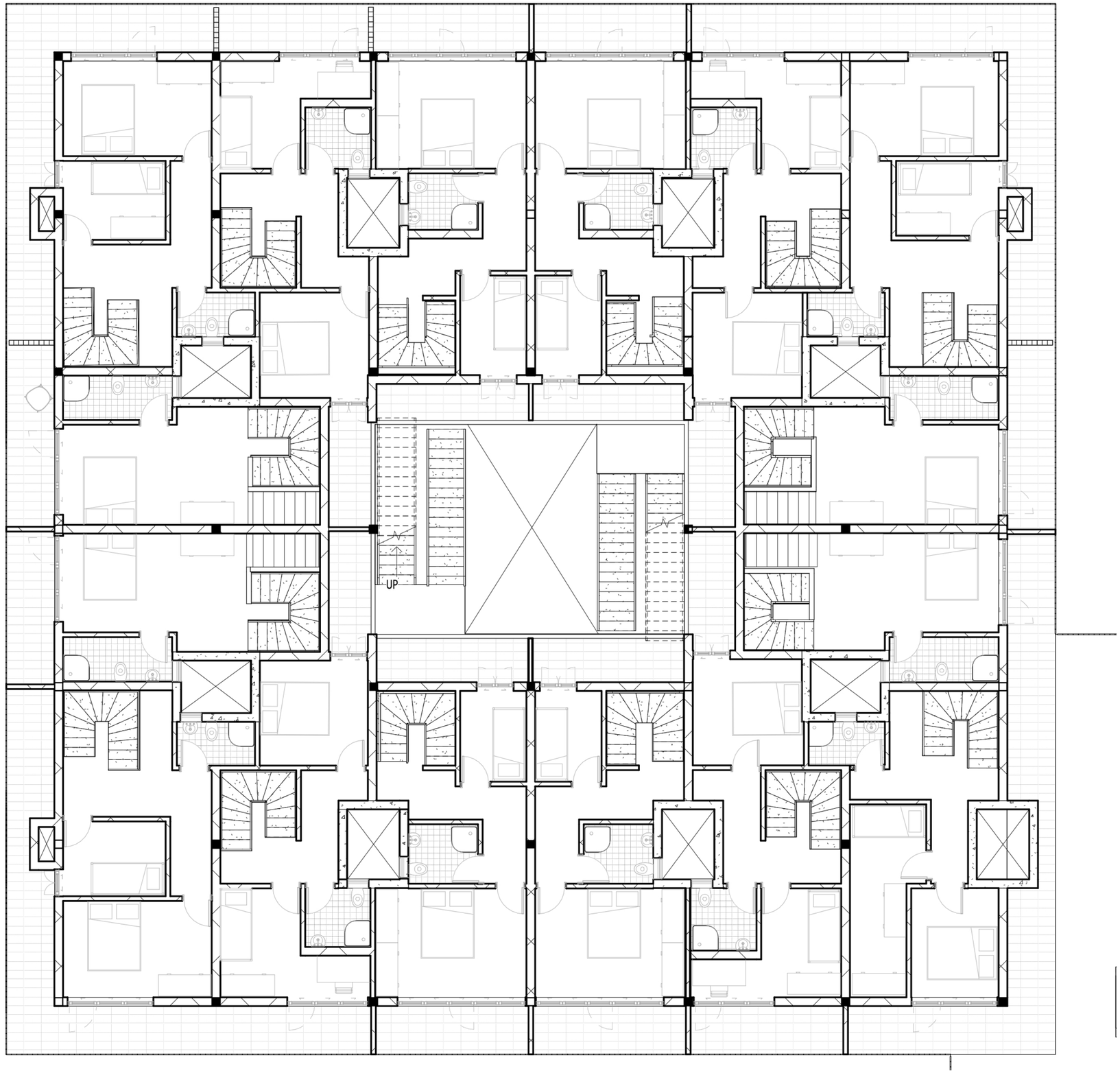




Design Results

Social Housing Typical Building layout - Fourth Floor

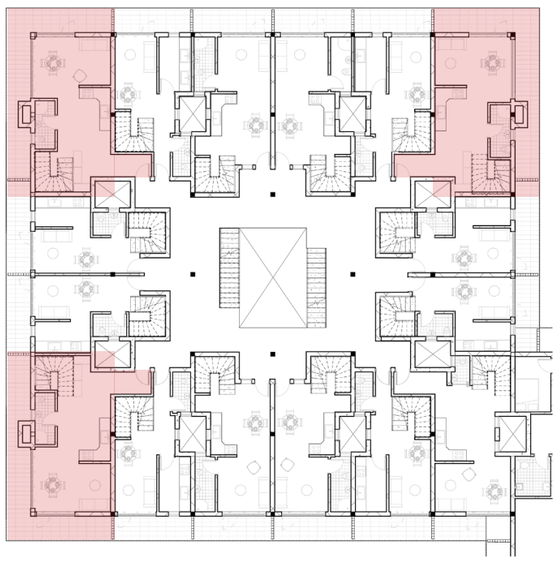




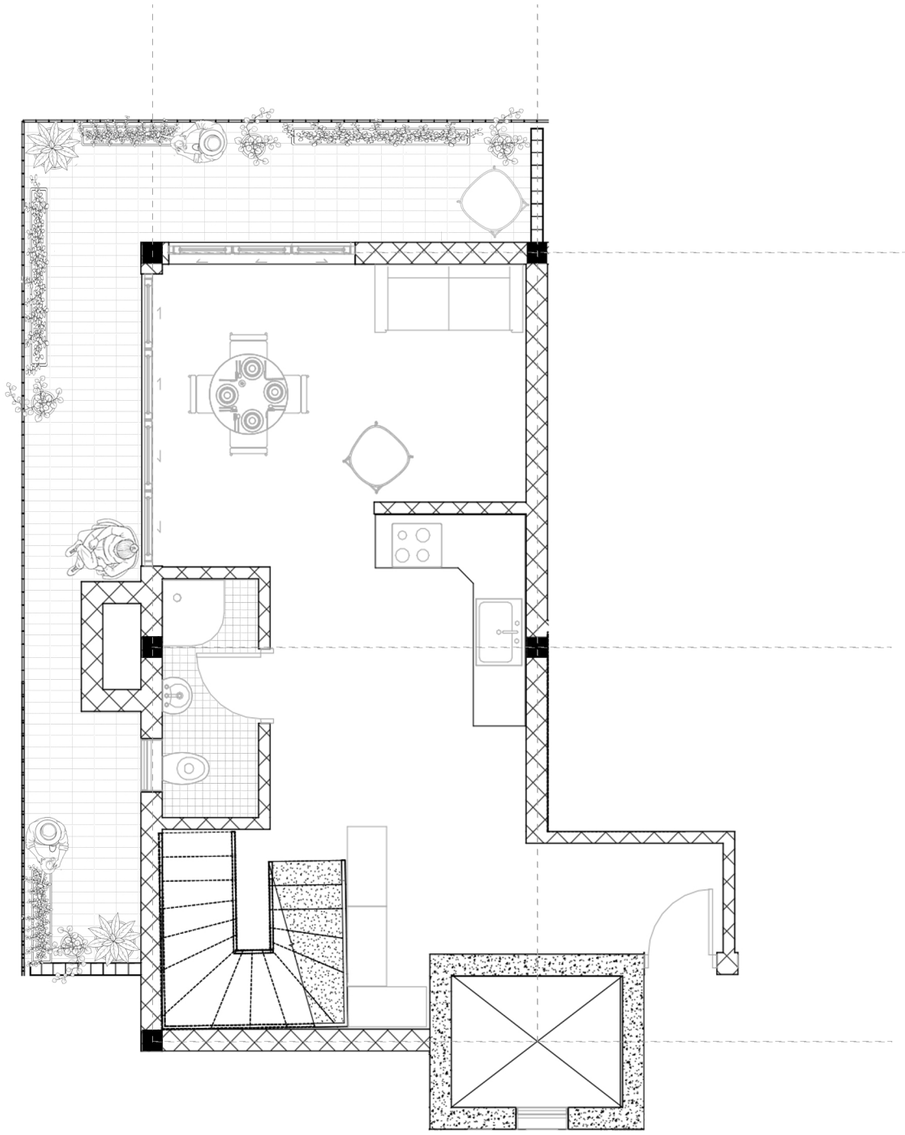
Design Results
Social and low income dwellings

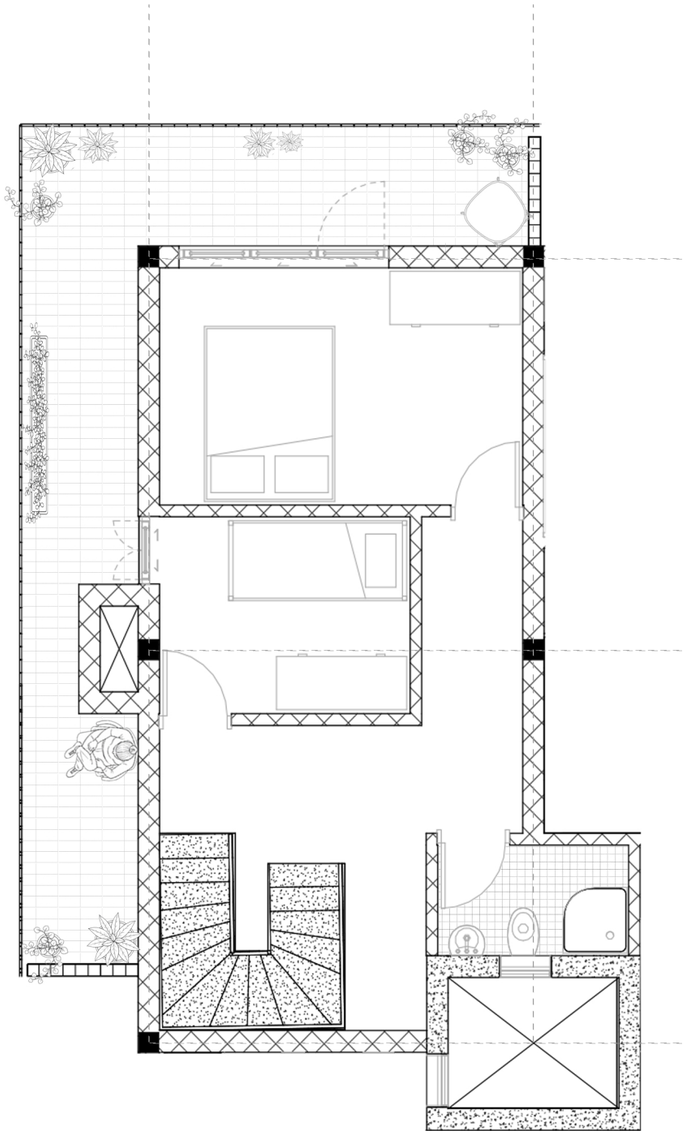
There are 4 duplex types in some social housing buildings. There are only 6 buildings that feature duplexes at the top level due to the building height. The building height excedeed 15 meters which normally would require an elevator. However, by the placement of the duplexes on the top level, the last floor is not taken into the height considerations, meaning the building does not make use of an elevator, maintaining maintanance cost as low as possible for this income category.

The duplexes range from 50 square meters, which is a one bedroom apartment to 72 square meters. Apart from the smallest duplex, all other apartments have two bedrooms.



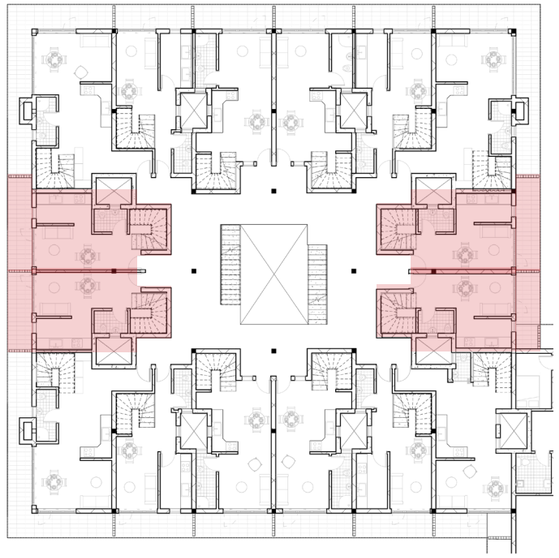
Type I
77 sqm.
18 units



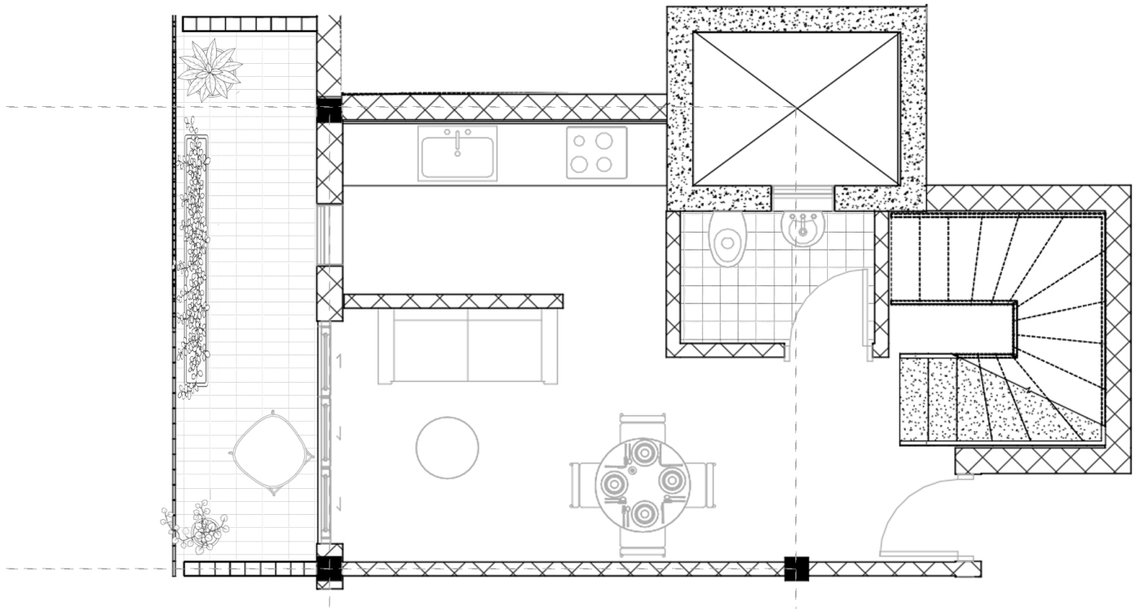


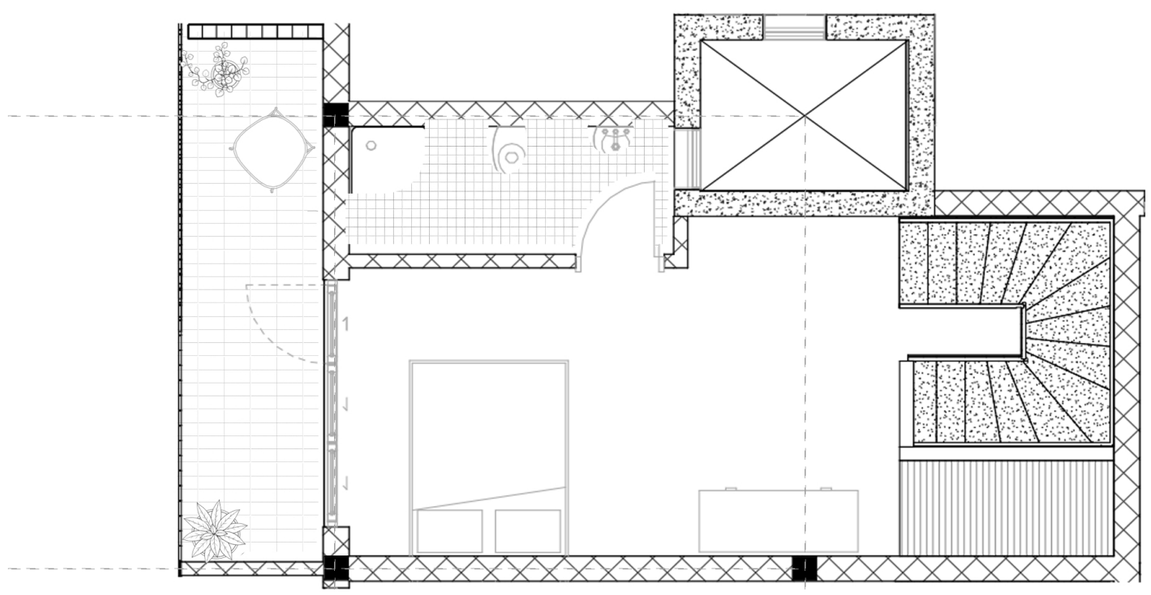
Design Results

Social and low income dwellings



Type L
60 sqm.
24 units

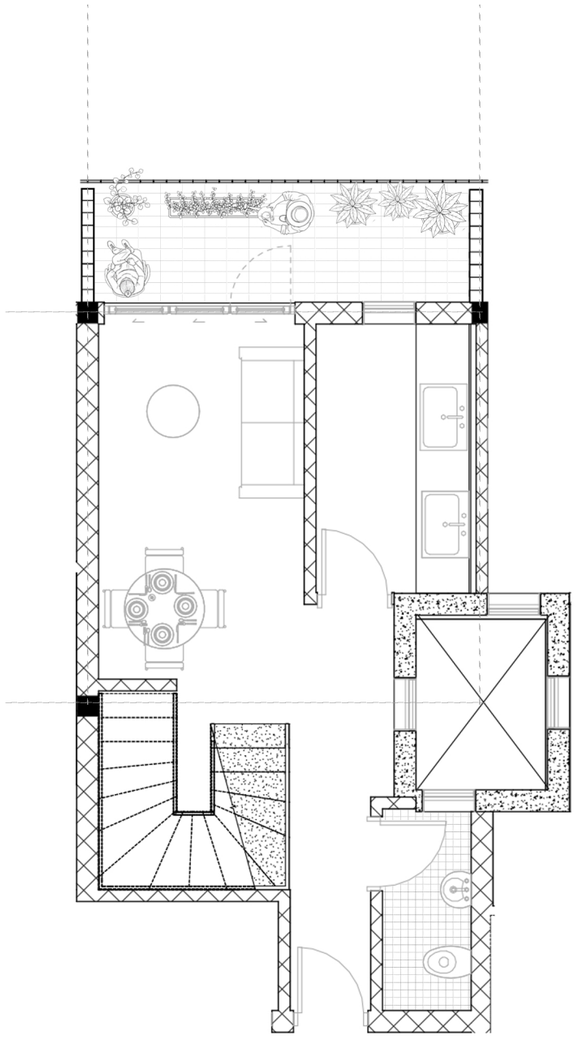


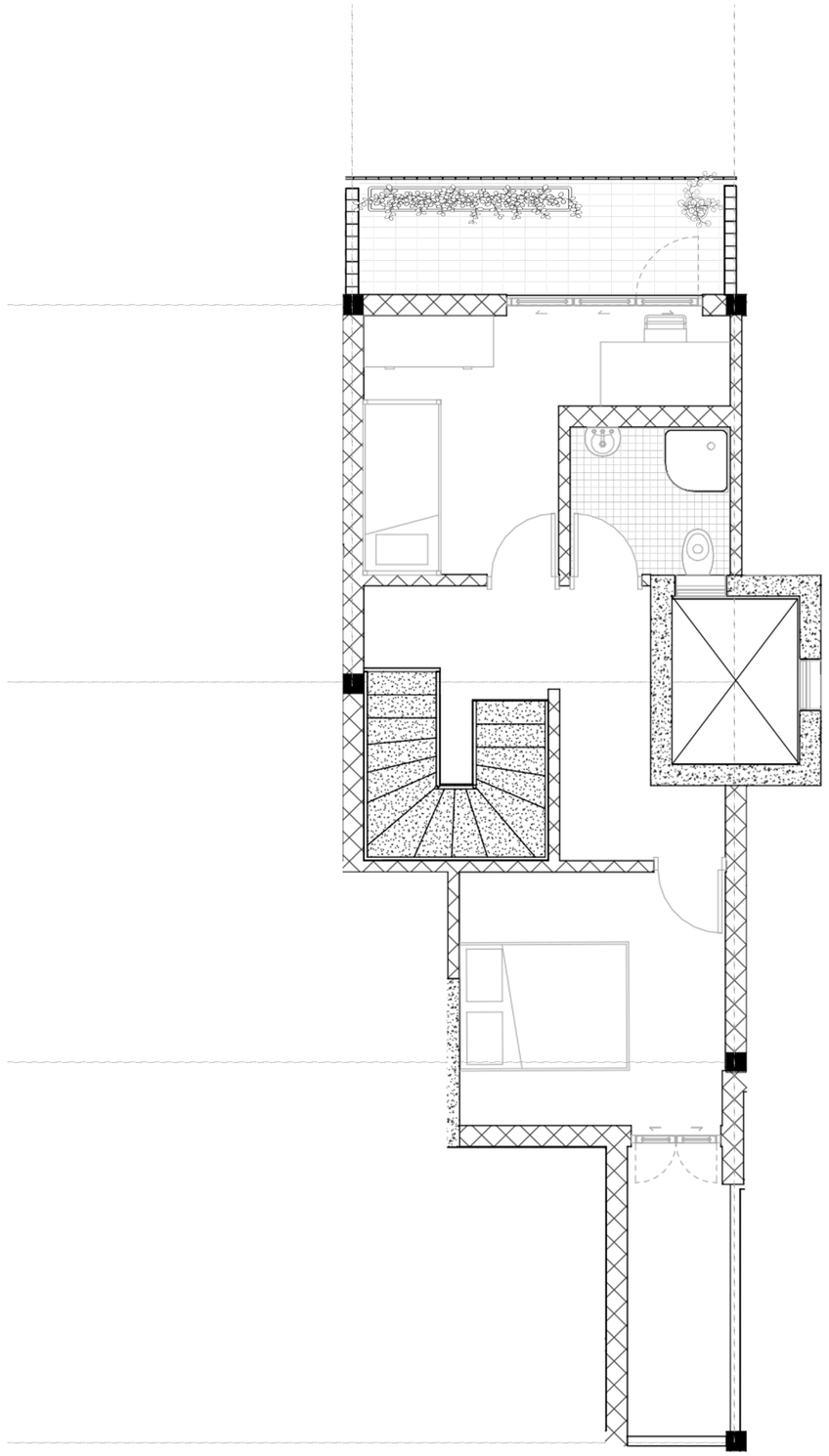


Design Results
Social and low income dwellings

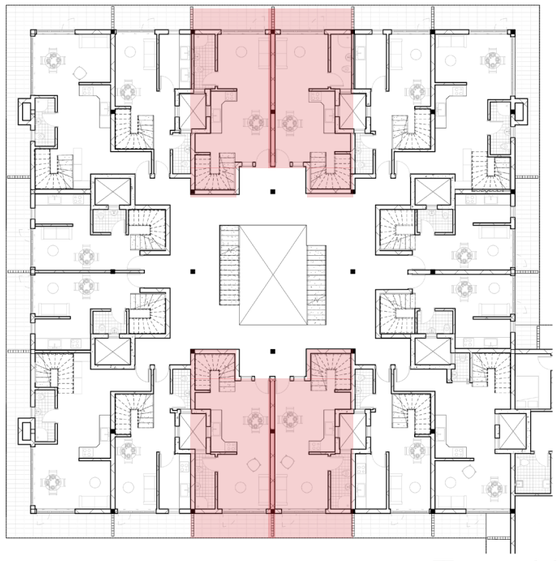


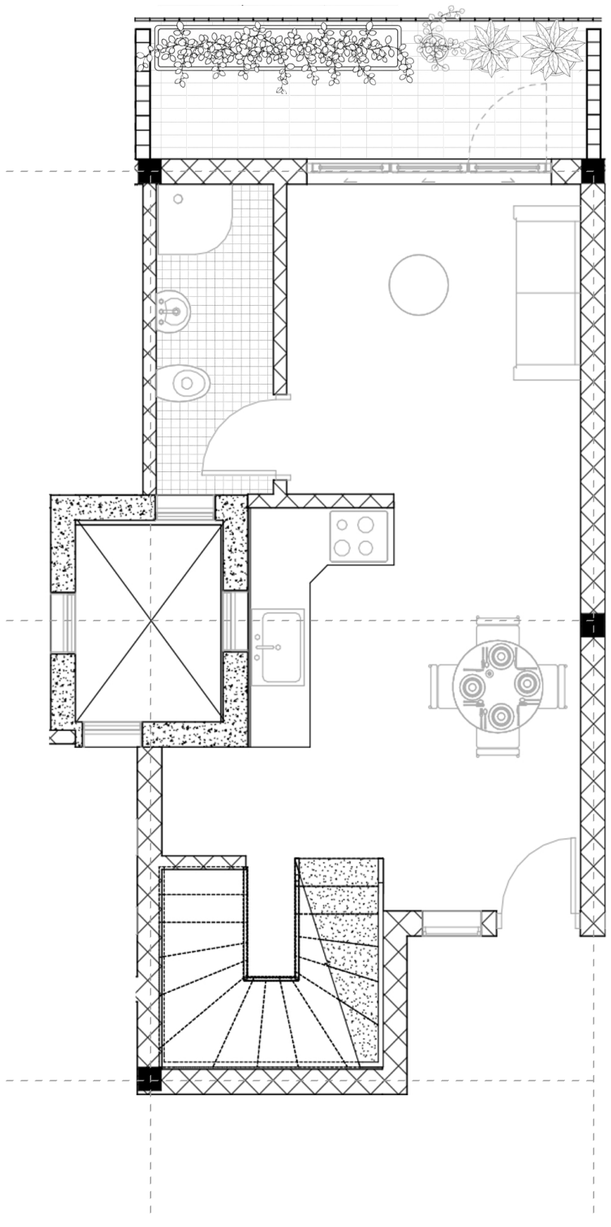
Type M
63 sqm.
24 units

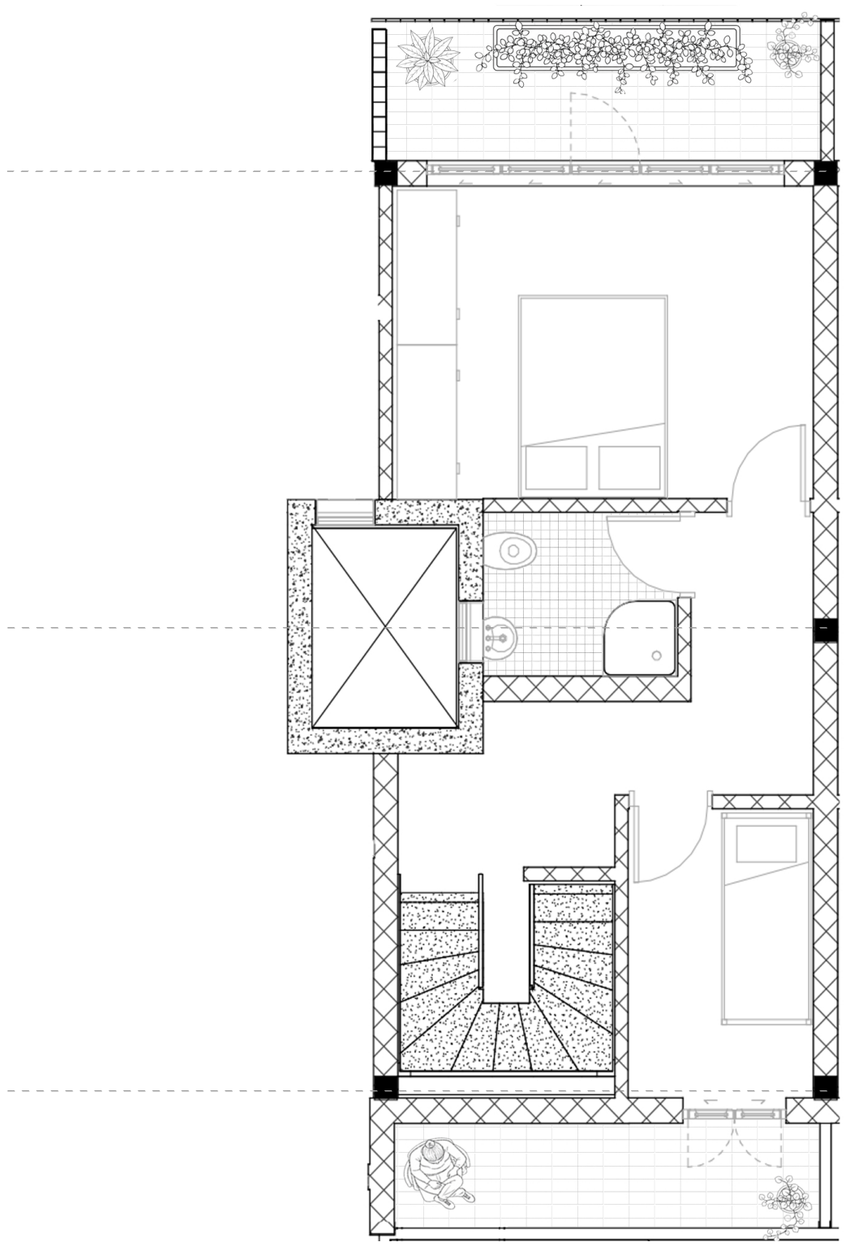




Design Results
Social and low income dwellings



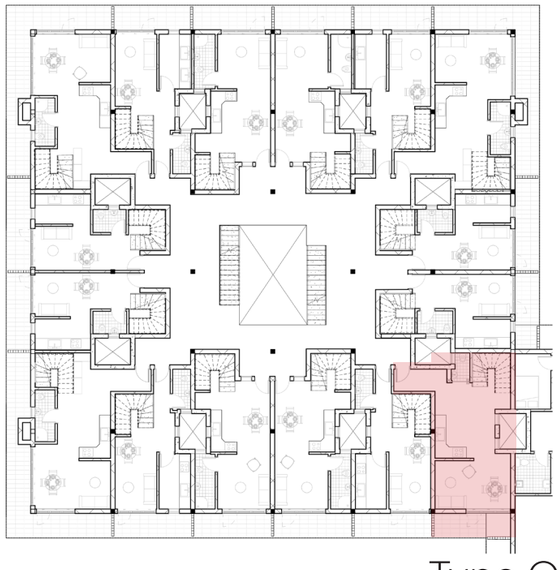




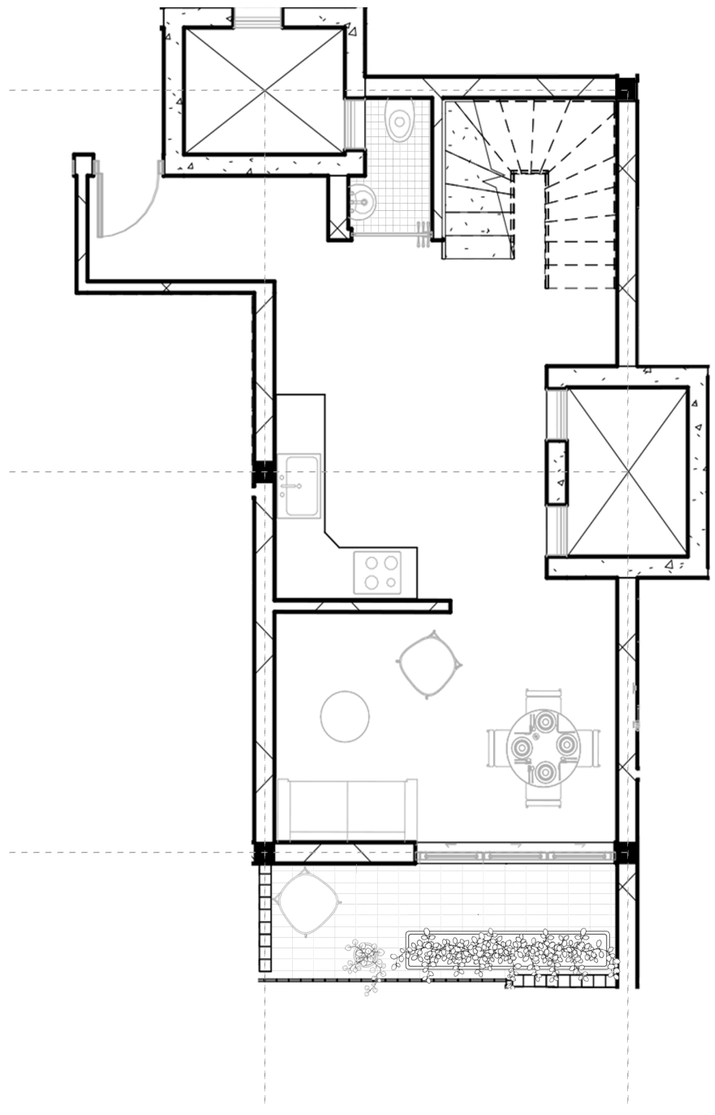
Type N
60 sqm.
24 units

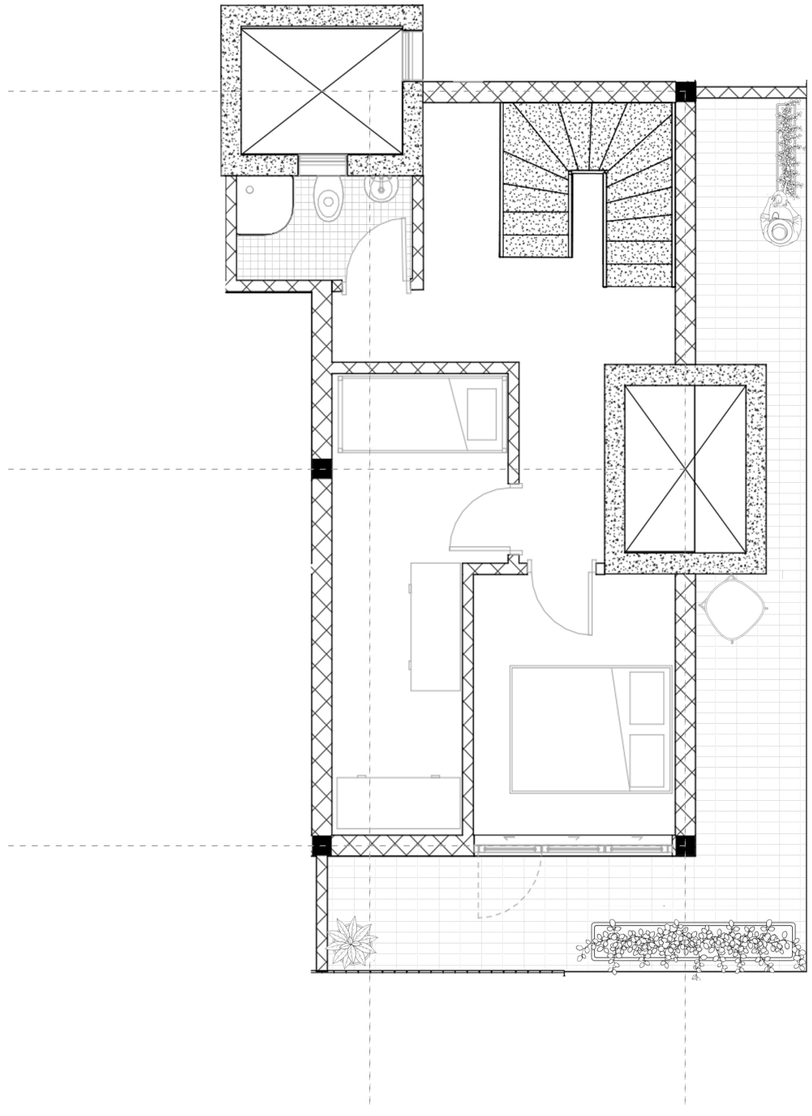
Design Results

Social and low income dwellings



Type O
70 sqm.
9 units





Design Results

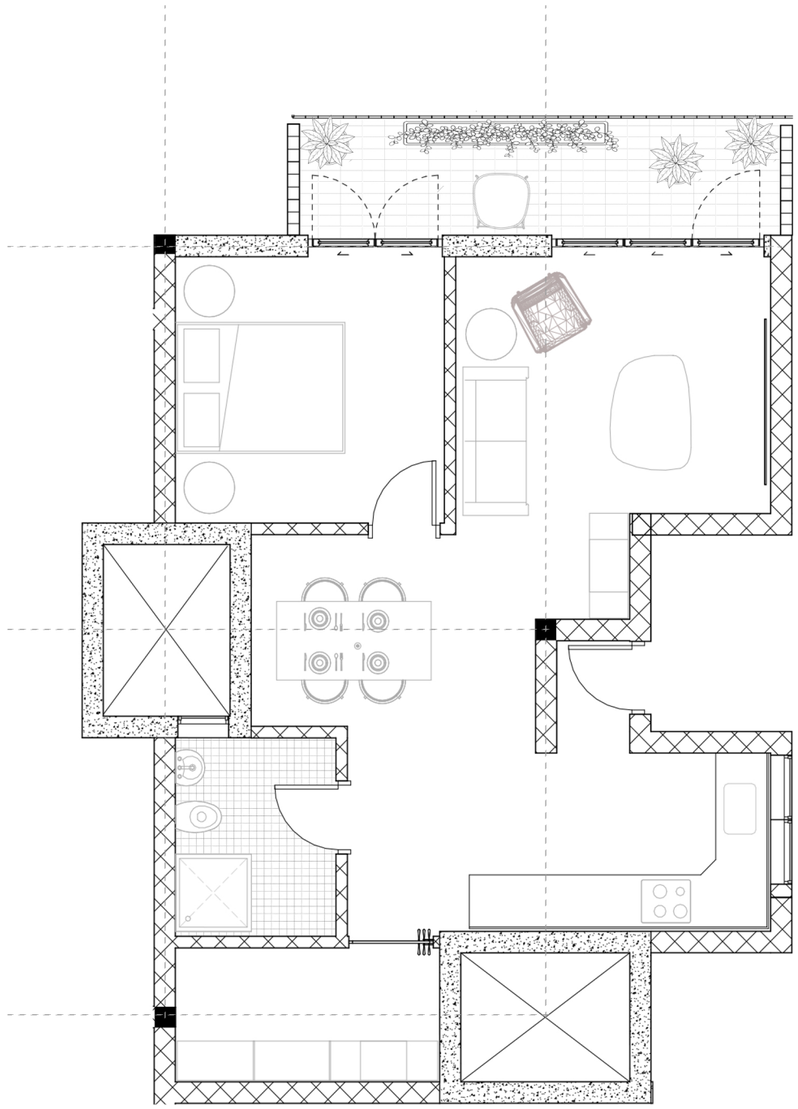
Cluster 3 second floor





Design Results

Social and low income dwellings



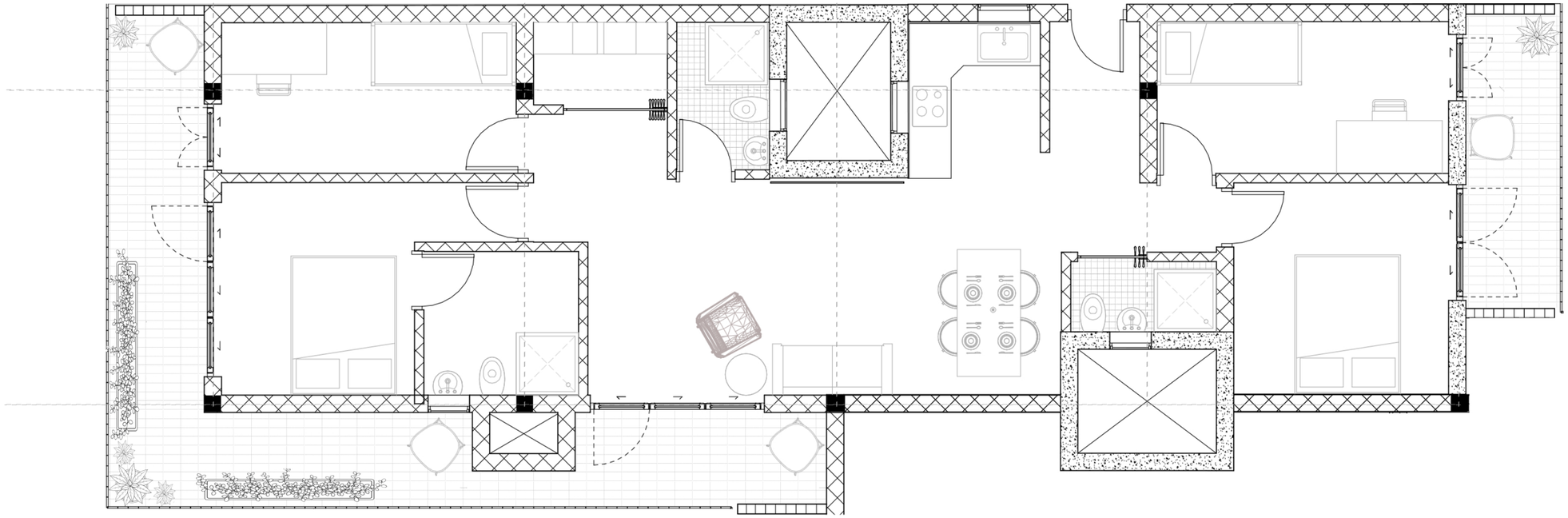


Type Y
3 units

Design Results
Social and low income dwellings



Type Z
1 unit

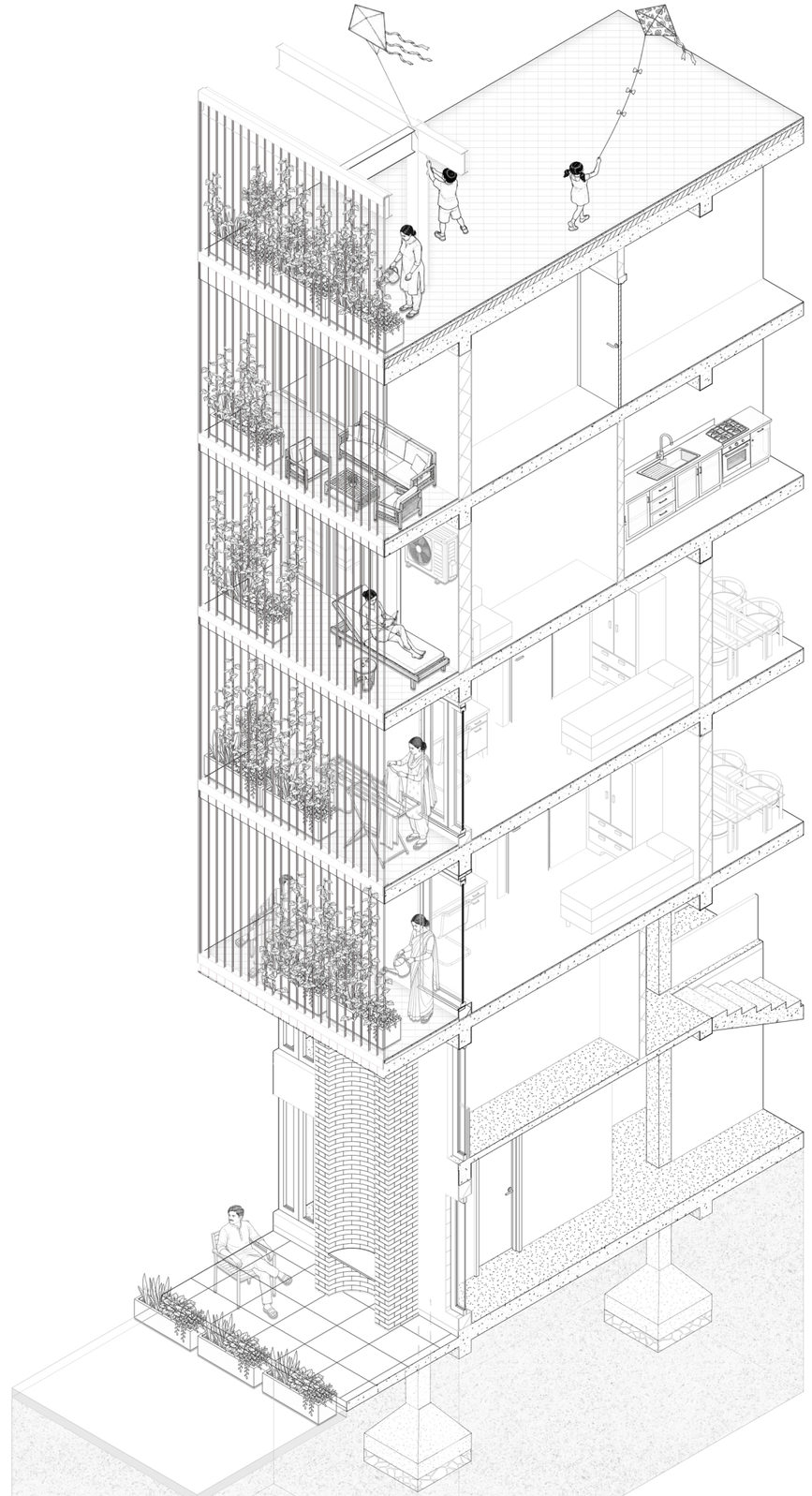


Design Results

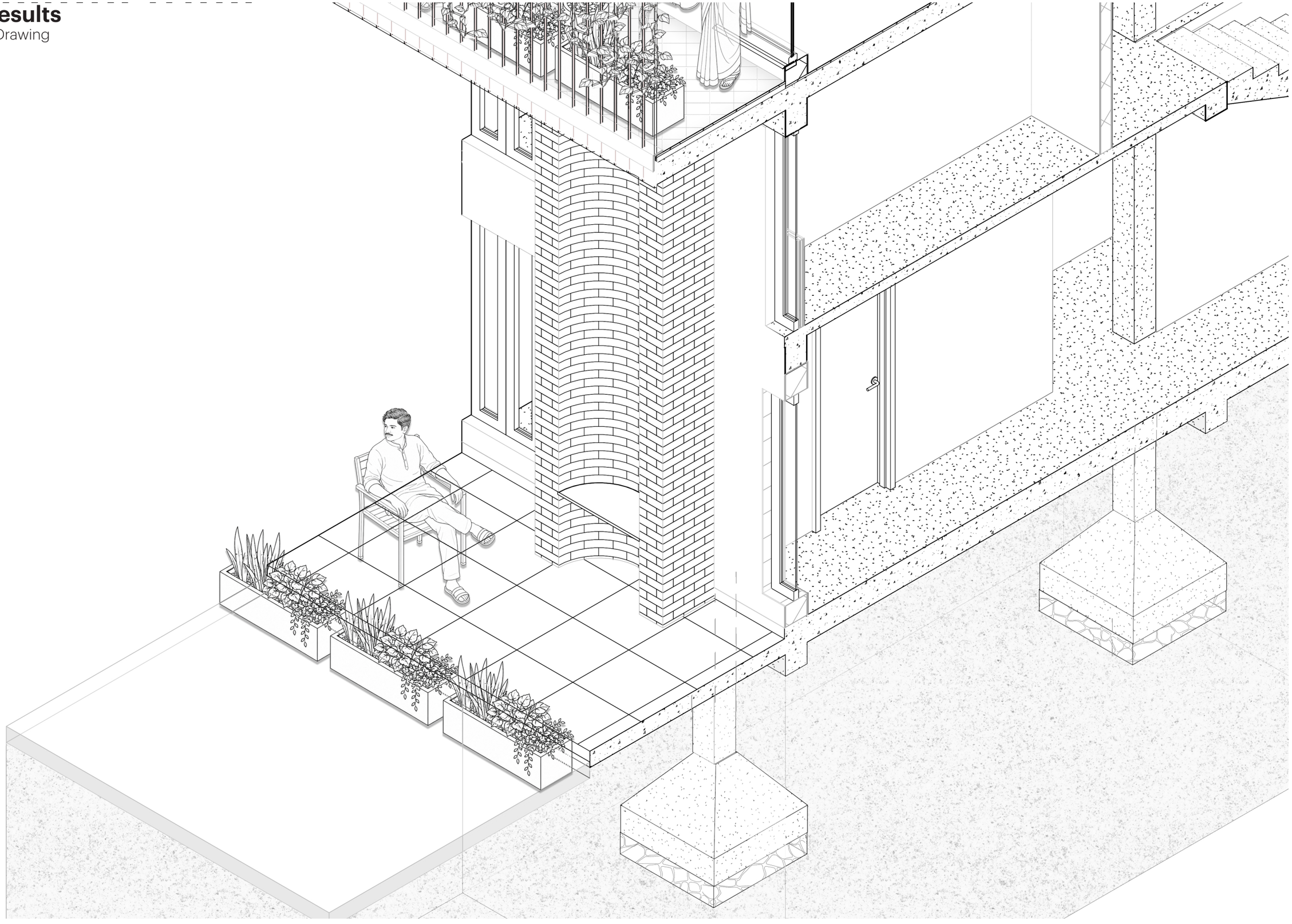
Combination Drawing

All buildings feature a green facade, that uses stainless steel cables, from top to bottom, on which plants can grow. Due to the hot climate of Ahmedabad, maintaining the cool inside is really important. This double skin helps cool down the air and shade the windows of the dwellings. The façade system integrates with the environmental and social theories proposed during the research. The KMC Corporate Office showed the use of vegetation as a filter rather than a decorative landscape (ArchDaily, 2023; RMA Architects, 2012). The double-skin façades reduce heat gain and improve privacy while providing shading and softening the urban environment.

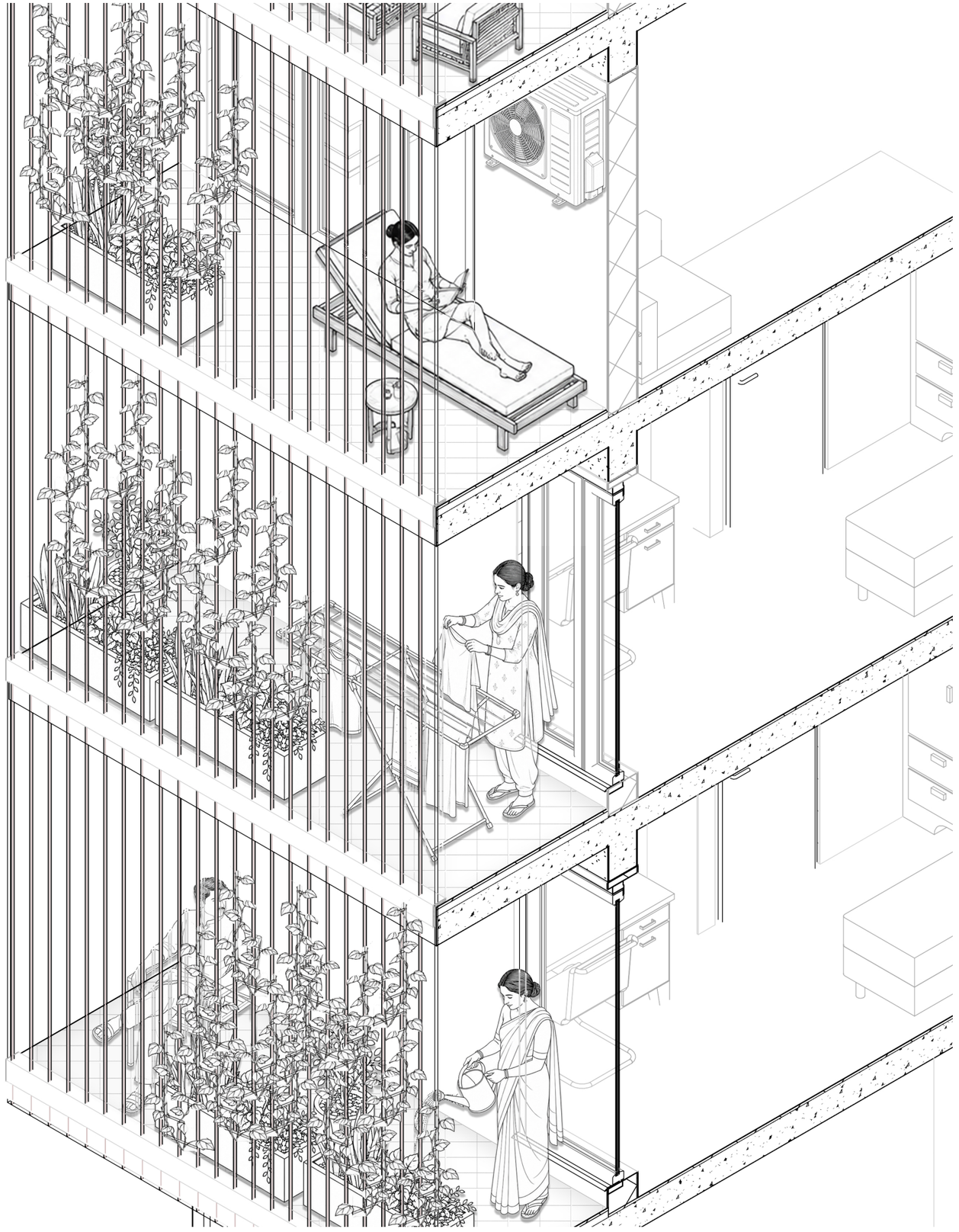
This solution mitigates the identified issue on the Rajiv Nagar. In the social housing and low income units, the users can adapt the balcony however they see fit. Whether they want to use the space to dry clothes, or socialise the facade accomodates their needs. Moreover, since the units are delivered as empty seed units, the materiality of the exterior walls can difer, some may choose to paint it in a certain color, while others might leave it as brick, therefore, the second skin helps maintain a certain cohesion within the plot.
Furthermore, the skin helps maintain privacy for the users. The environment is dense, so the feeling of privacy can sometime be an issue, which the facades help mitigate.
In adittion, the facades will help cover up the AC units, if the residents will decide to install it.



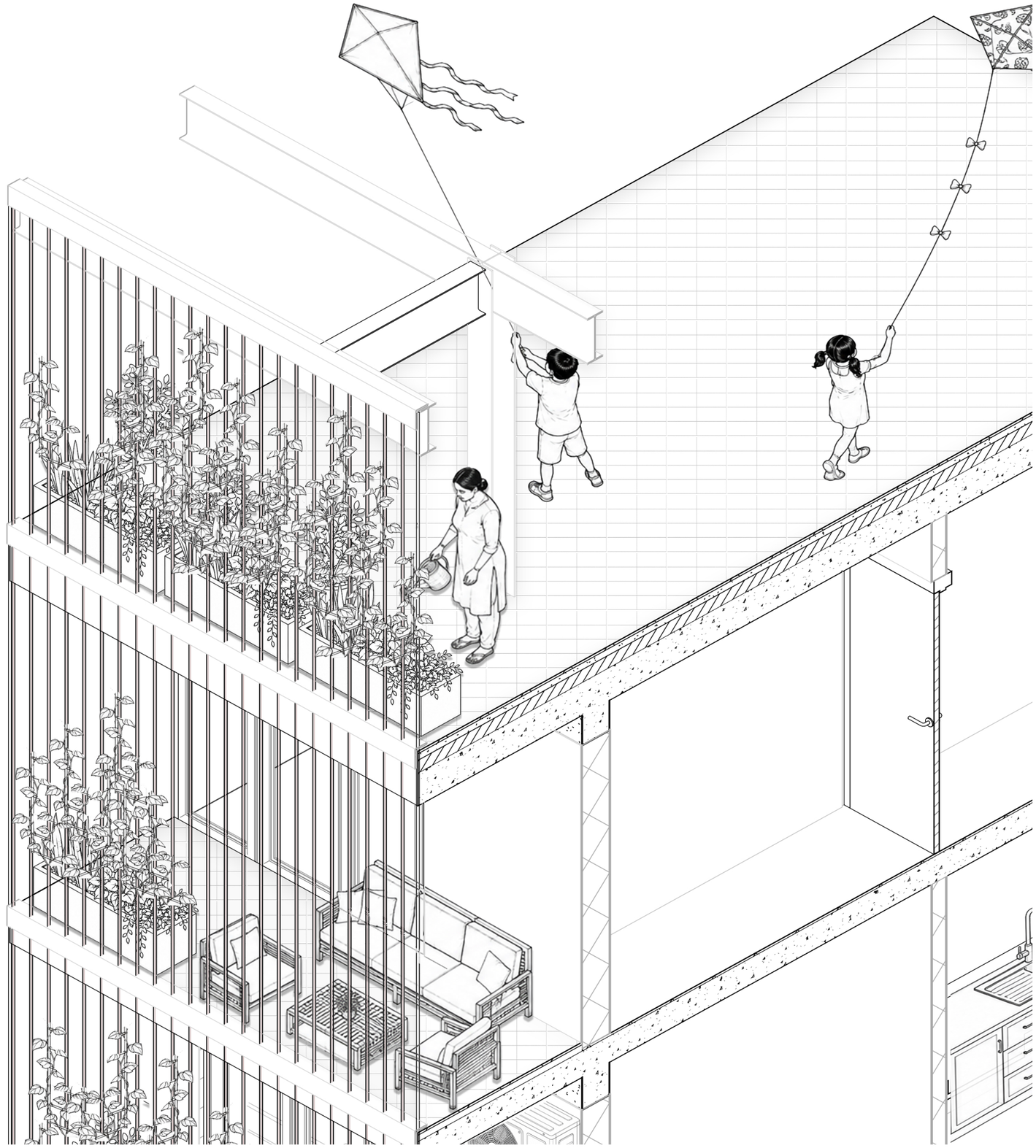
Design Results
Combination Drawing



Design Results
Combination Drawing



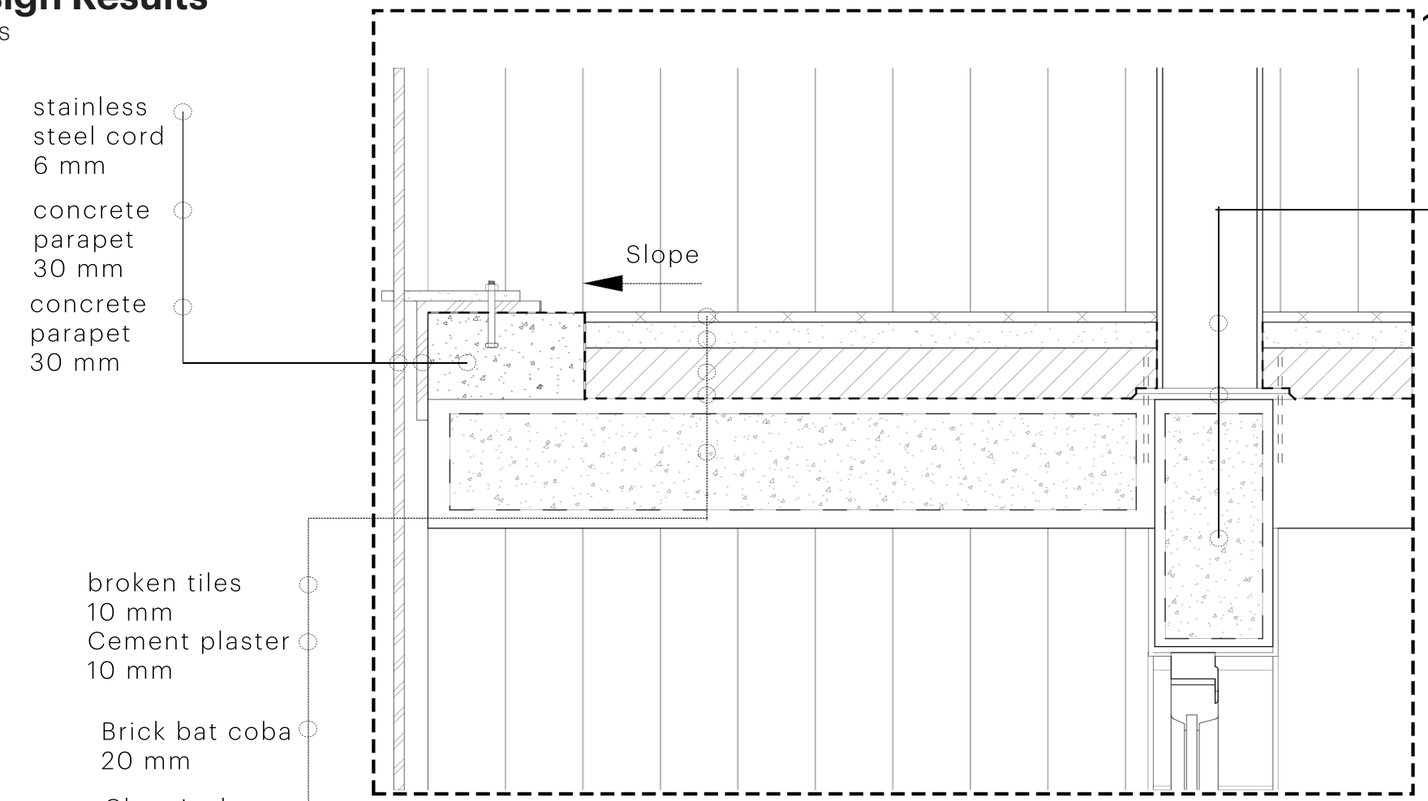
Design Results
Combination Drawing



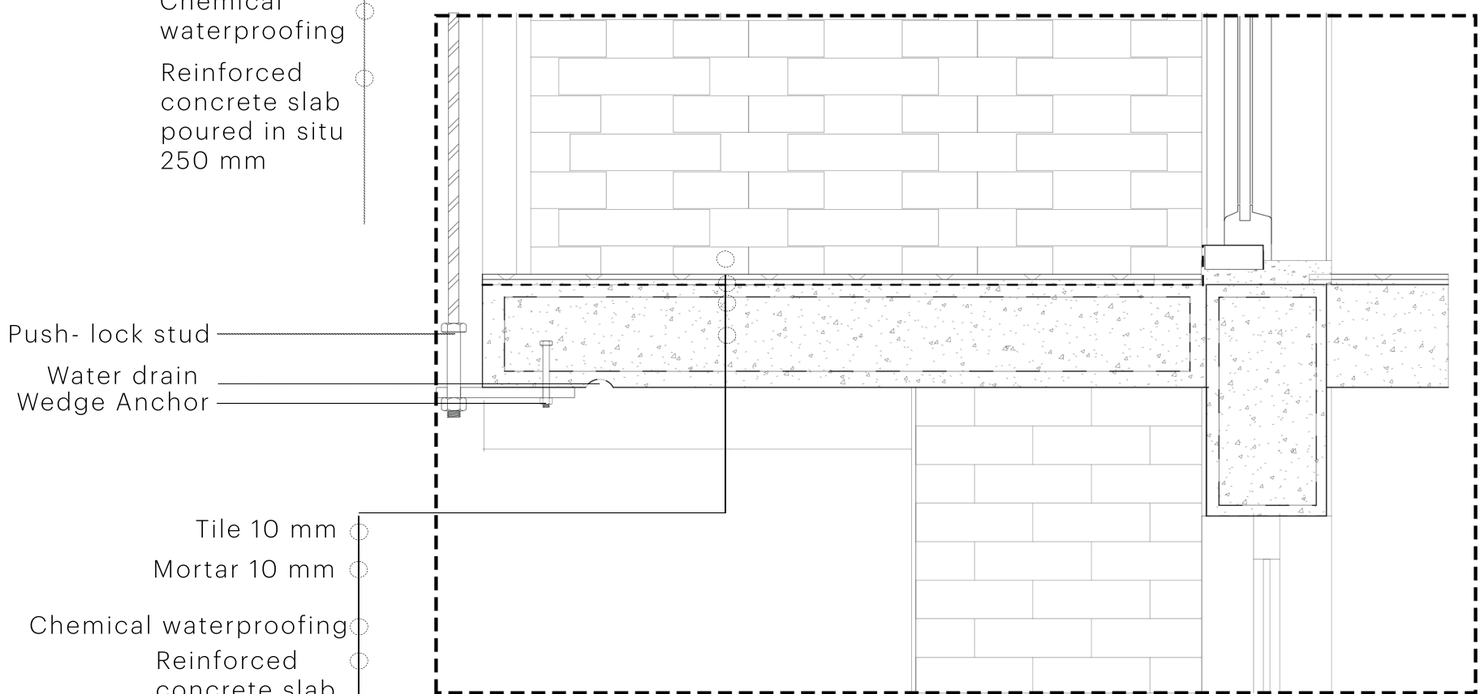
Design Results

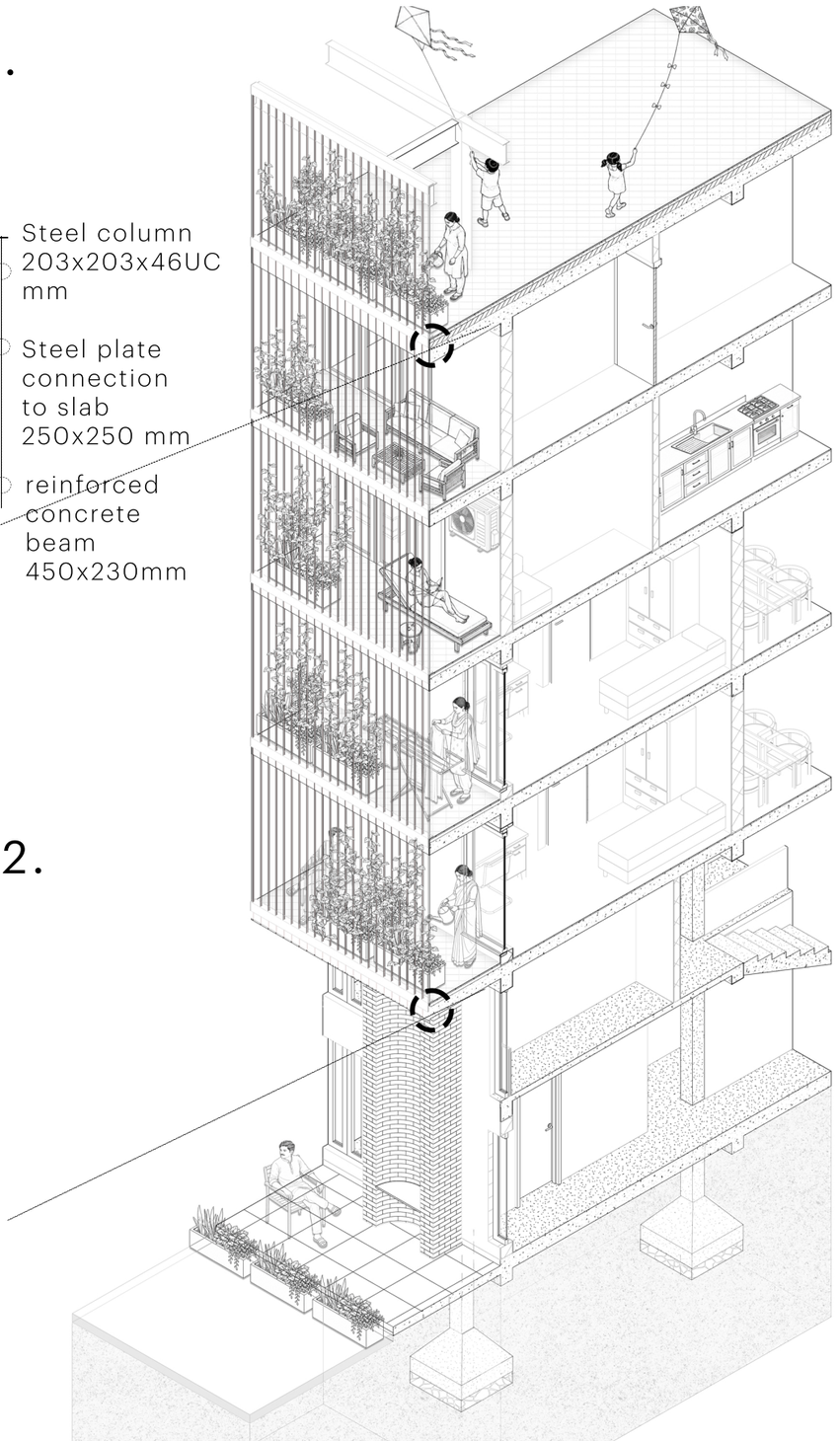
Details

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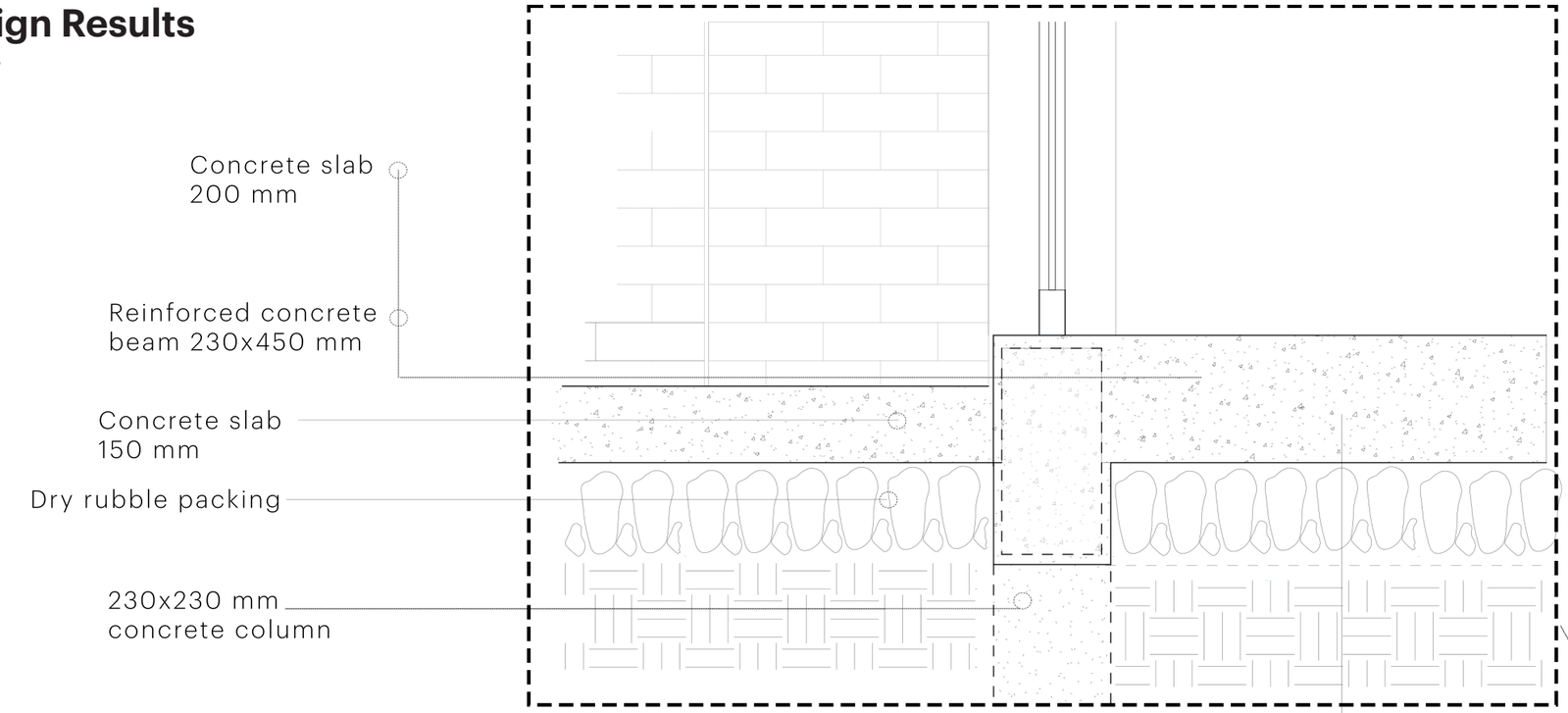


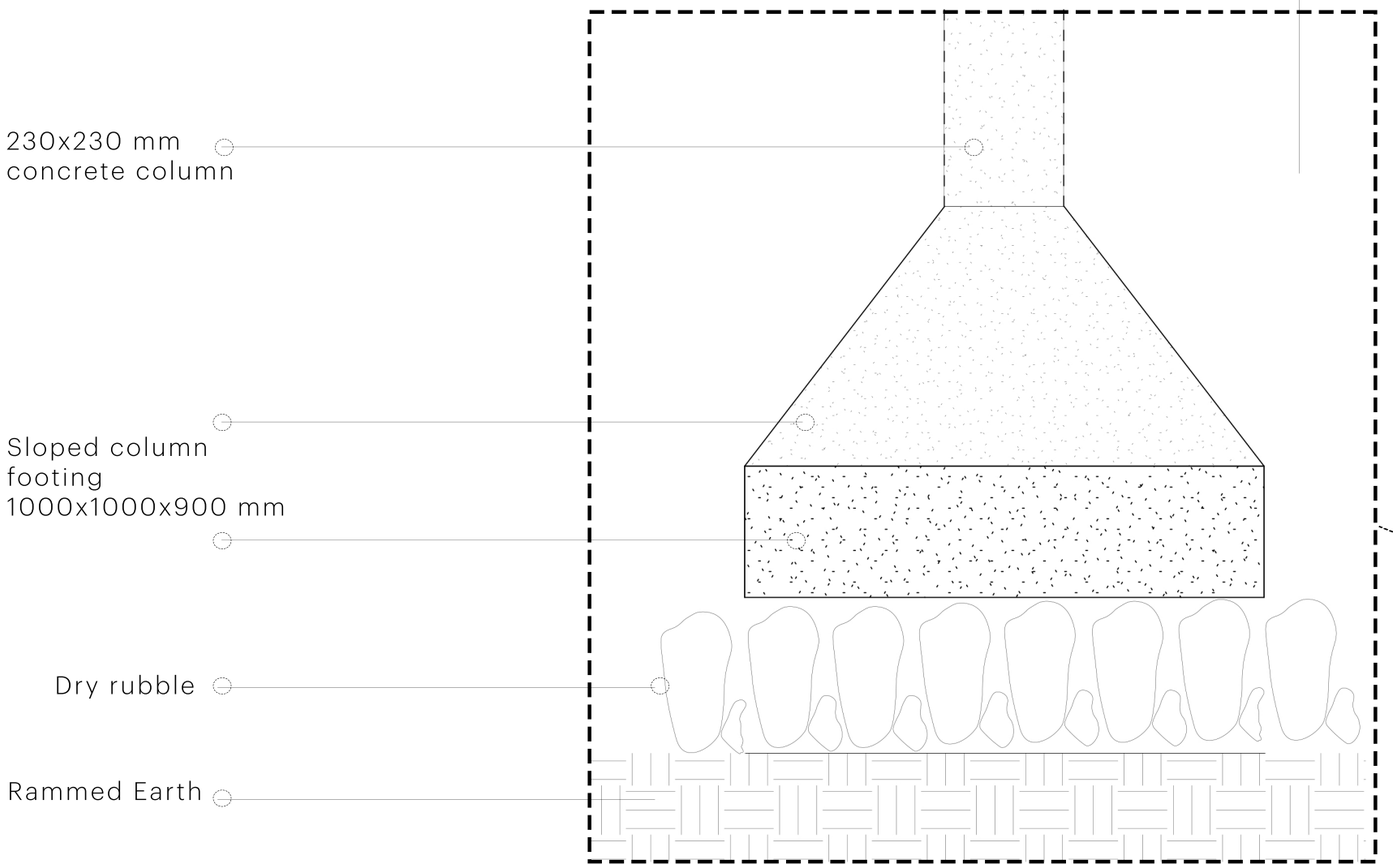
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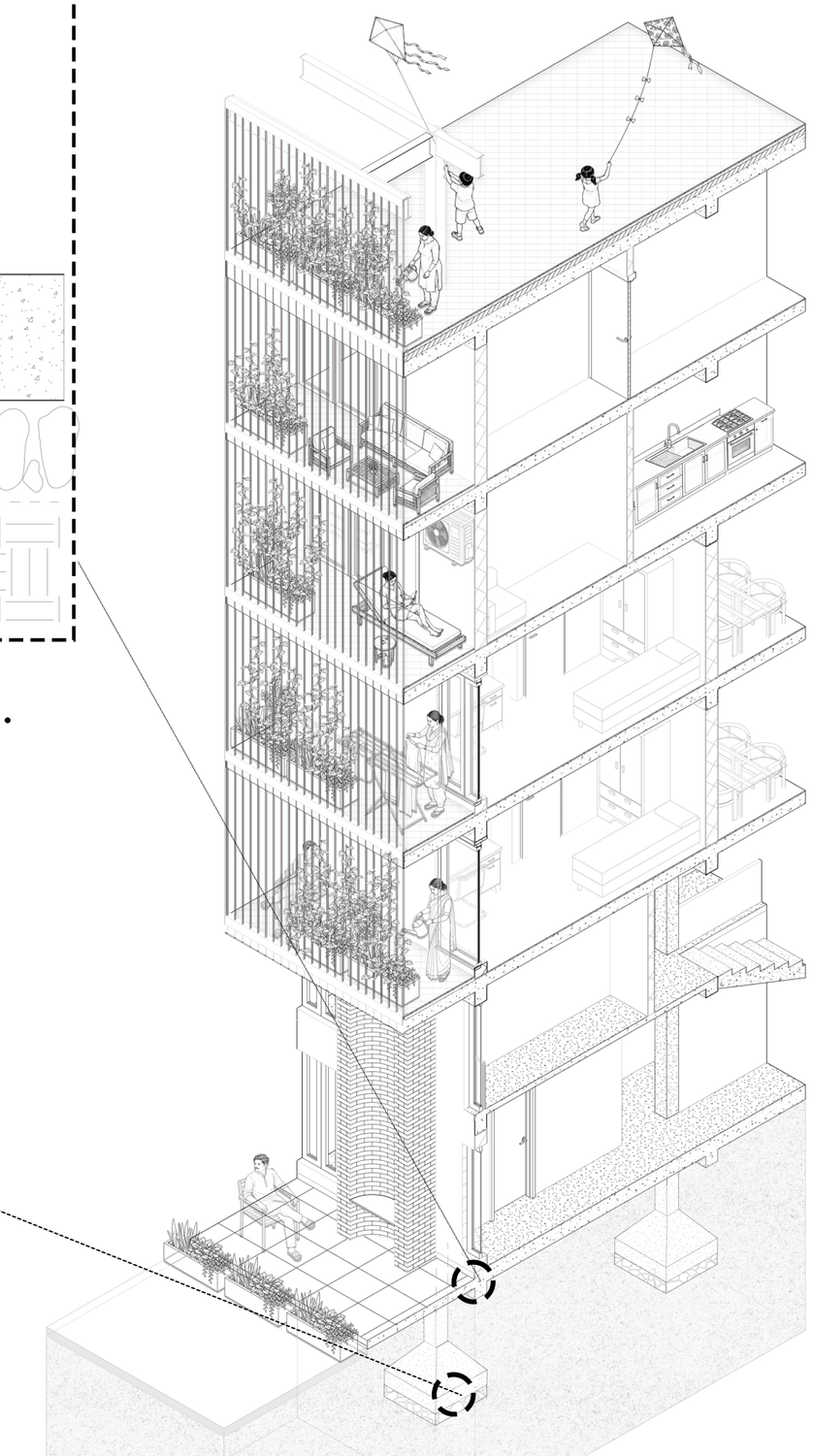


Design Results
Details





3.



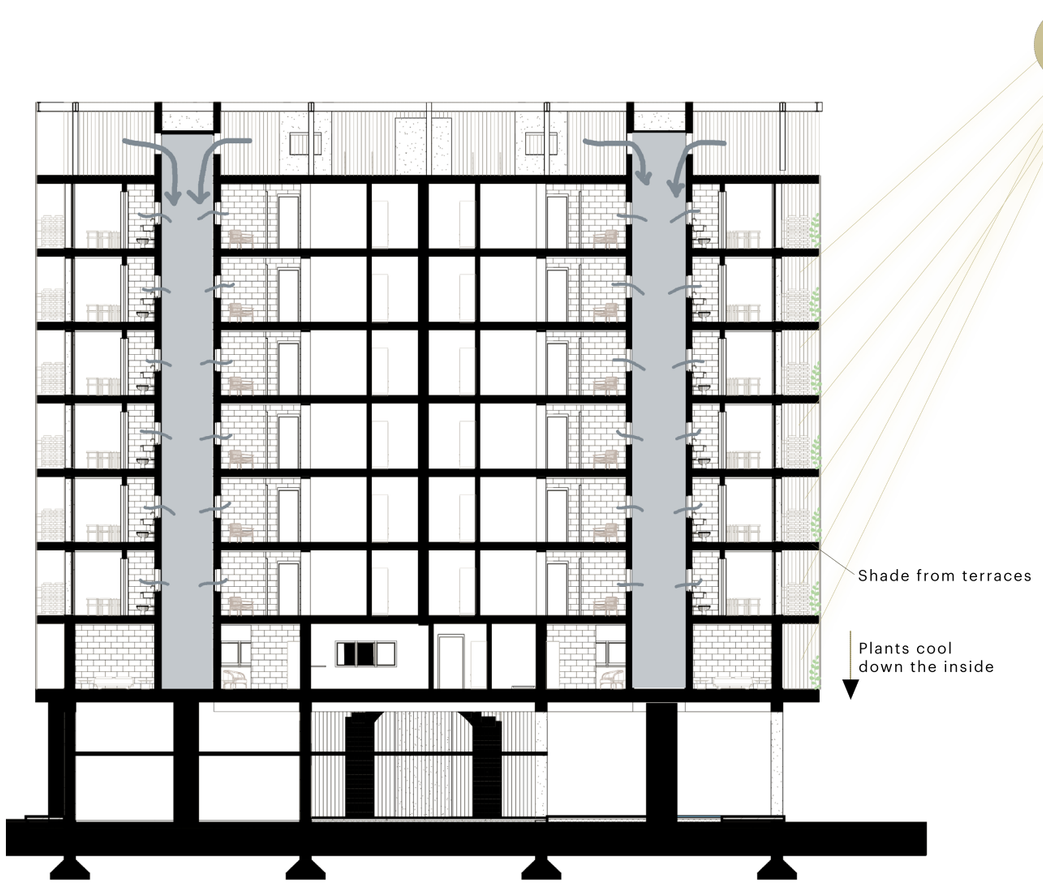
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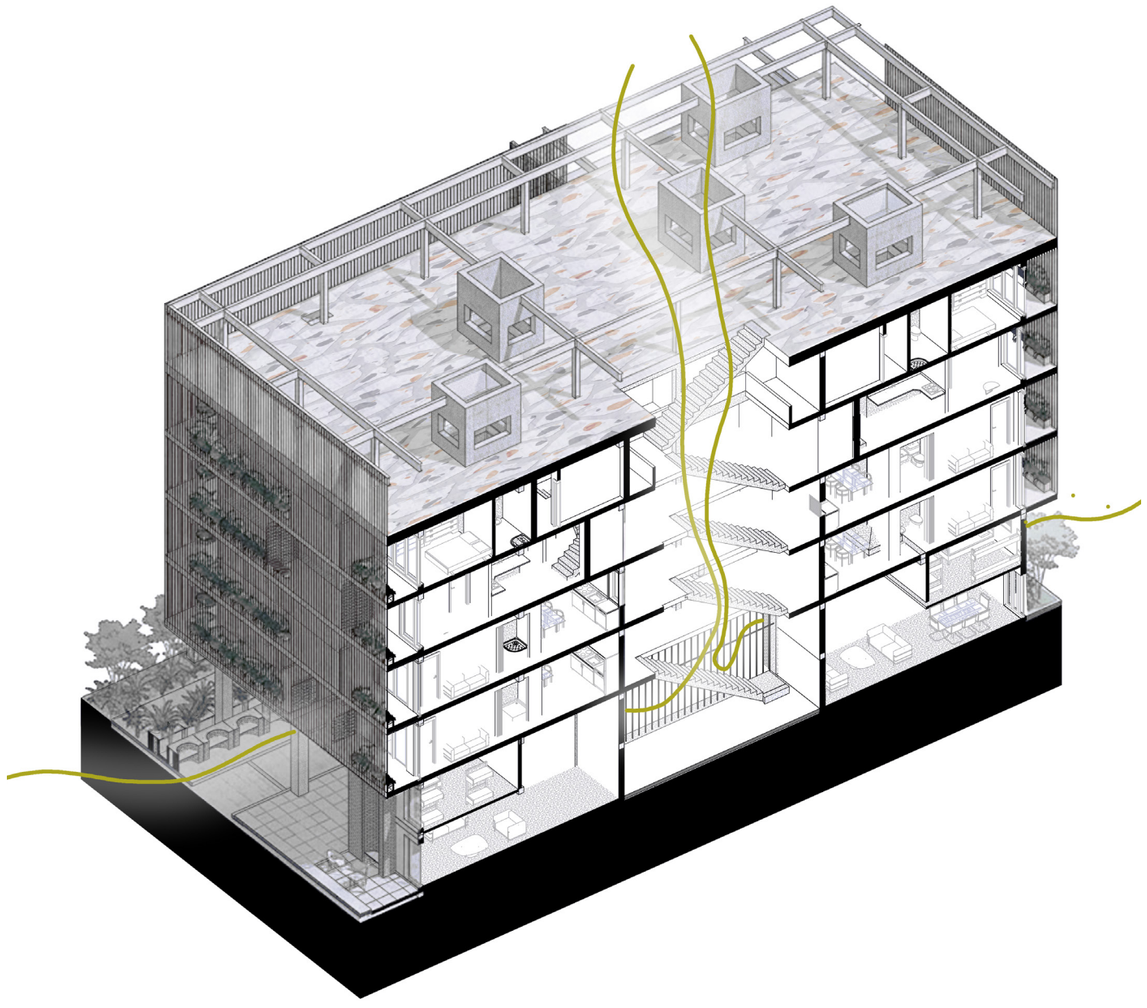
Design Results

Climate diagram

Water management is solved through the use of the cores. Two apartments share a core, which leads directly to the roof where a water tank is placed on top.

Moreover, the cores serve as ventilations for bathrooms and sometimes kitchens. The open space tunnels on the ground floor communicate with the central cores, therefore create a ventilated void inside the buildings. The opening on the top with the tunnels on the ground floor create vertical ventilation.





Design Results

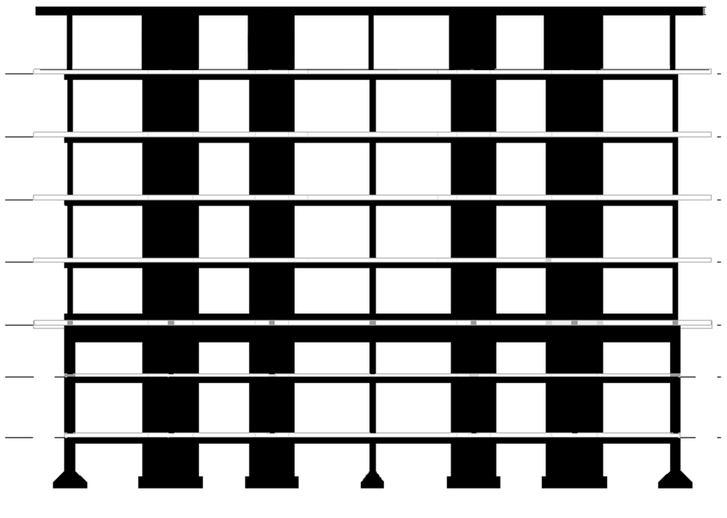
View from balcony

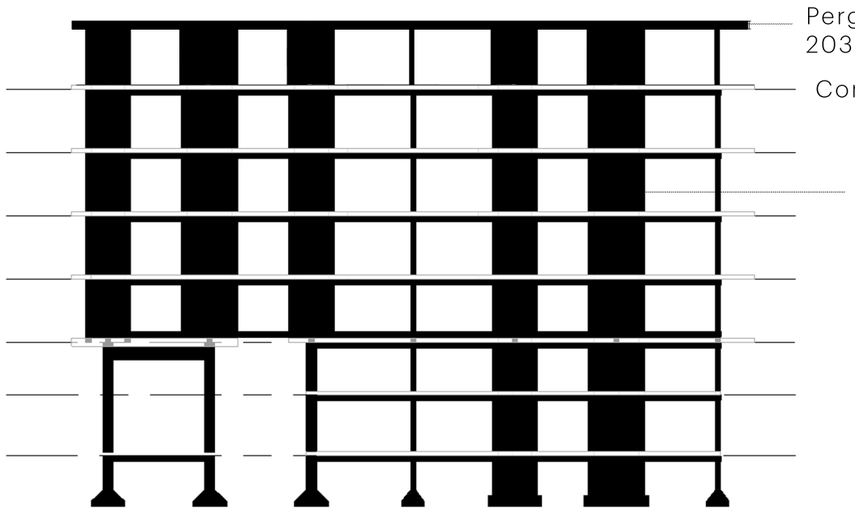


Design Results

Structure

The structure of the building is made out of concrete columns, concrete beams and concrete cores. On the ground floor where open spaces form the structure uses 450x450 mm columns and 900 mm beams, while if the structure respects the 4.5x4.5 grid the columns are 230x230mm.
The building makes use of in situ concrete slabs.





Pergola 360Wx32.9 steel beams
203x203 steel columns

Concrete cores

G+n

G+2

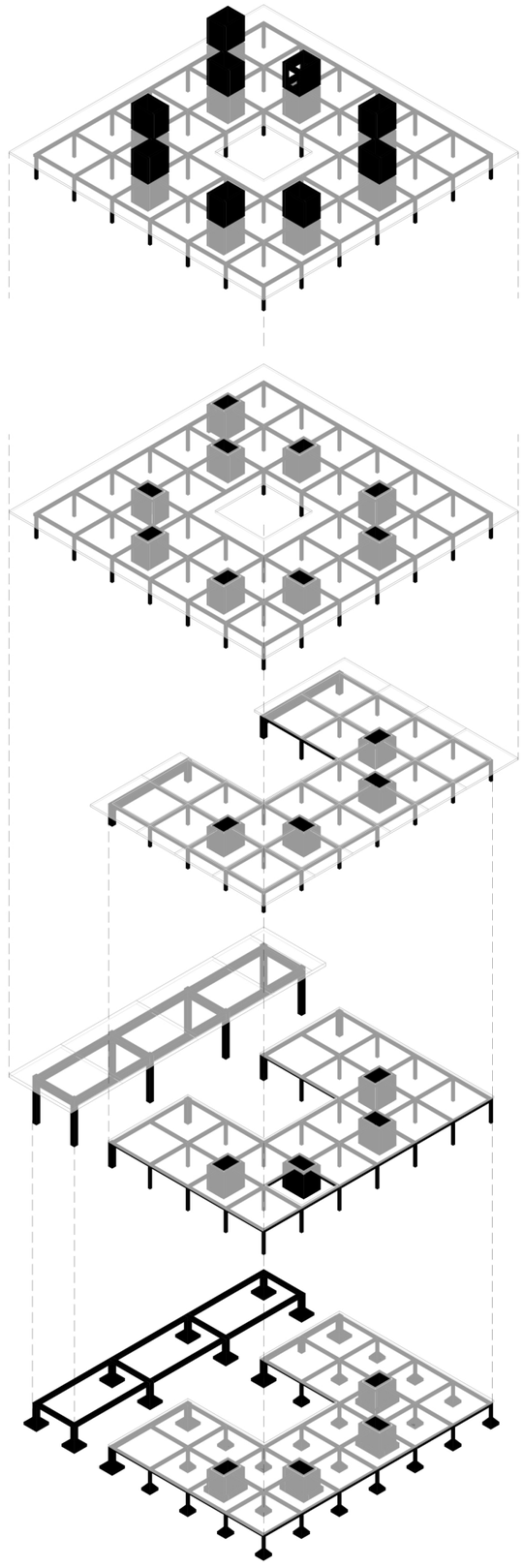
230x230 concrete columns
200 mm concrete slabs
330x450 concrete beams
Concrete cores 250x250 thk

G+1

350 mm concrete slabs
450x900 concrete beams
450x450 concrete columns

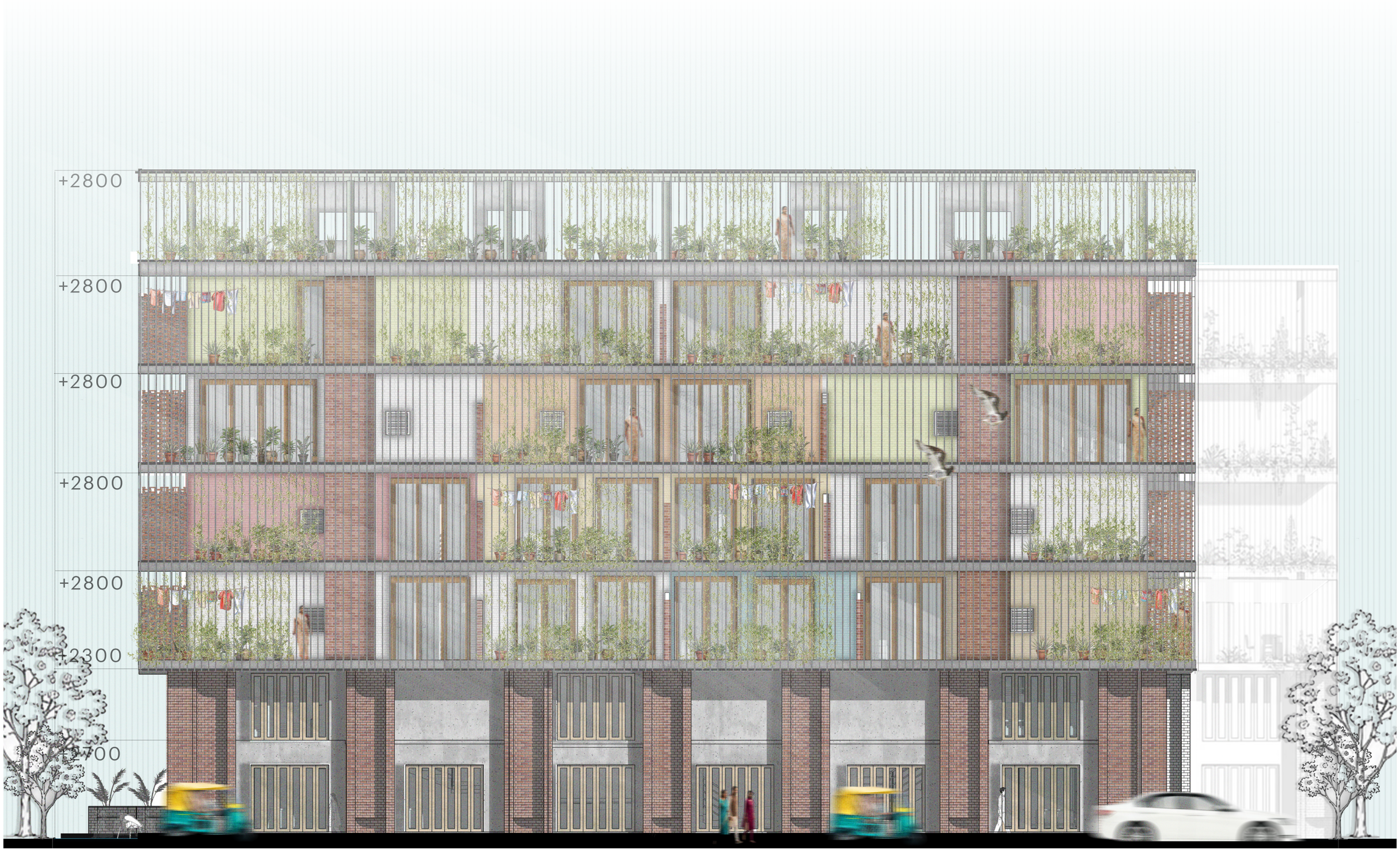
Mezzanine

Ground floor



Design Results

West Elevation

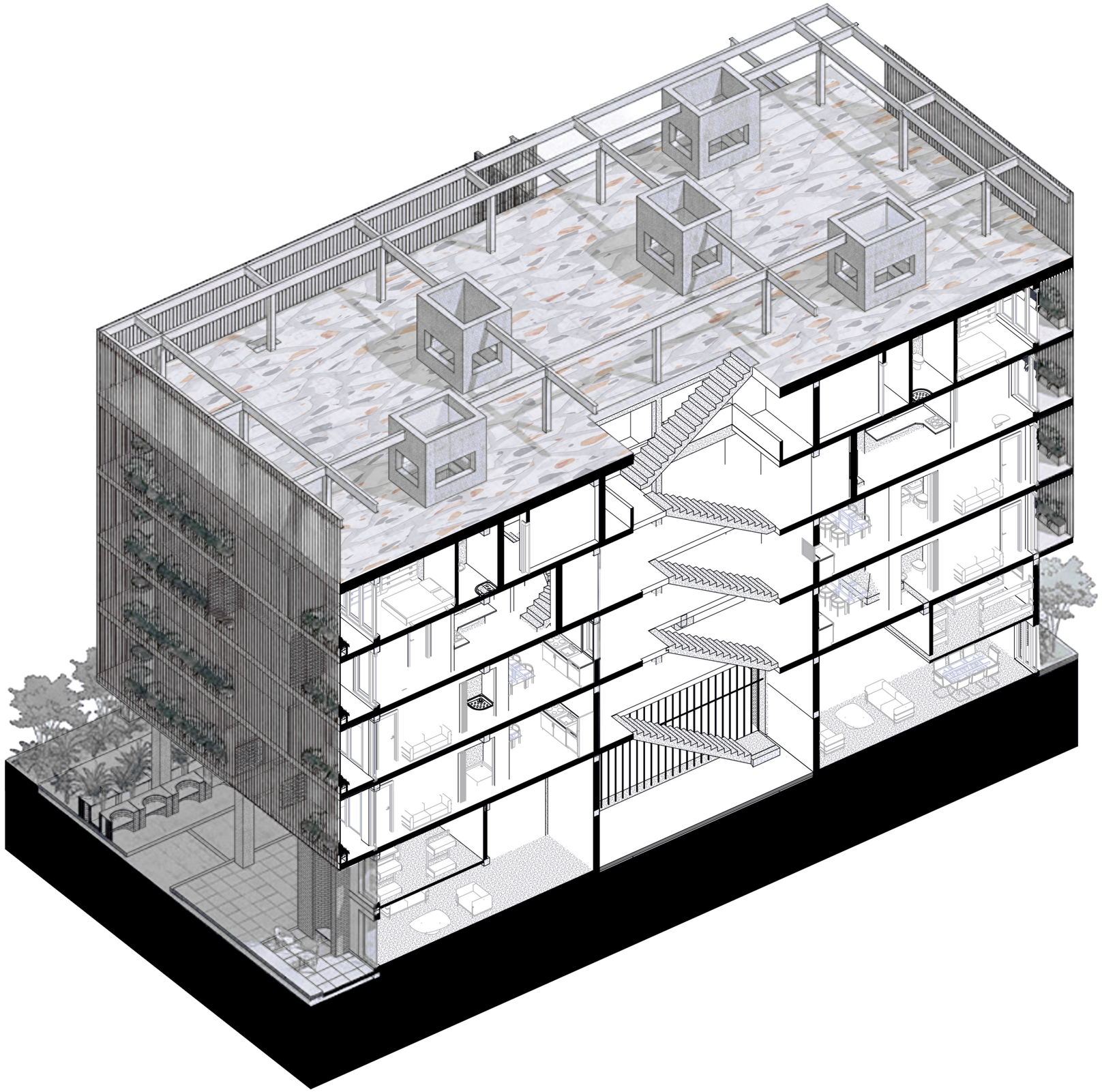


Design Results

North Elevation



Design Results
Section



Design Results

The roofscape is a core feature of this proposal and exemplifies the “fifth elevation” theory. Here, the roofs, rather than being passive, technical surfaces, become active, stepped, communal landscapes. Roofs have been designed as social platforms where the residents can gather, rest, cook, dry clothes, celebrate, and where children can play in a safe environment, away from the roads and traffic. This strategy is based on the observations of the rooftop cultures of the highly populated Indian cities, where the roofs serve as extensions of the families and communities (Transforming Rooftop Terraces to Third Places in Urban India, 2026).

The stepped roof geometry also provides environmental benefits. It enhances airflow, minimizes heat retention, and creates shaded terraces around the project. Roofs, like stepwells, function as both social and climatic elements, similar to the application of that logic in the Prestige University case (Sanjay Puri Architects, 2022). The combination of vegetation along roof terraces and elevated communal spaces provides additional cooling. It also augments the densely built environment, drawing references from built works like the Urban Garden from Loizou Architects and the KMC Corporate office from RMA Architects (ArchDaily, 2023; RMA Architects, 2012).

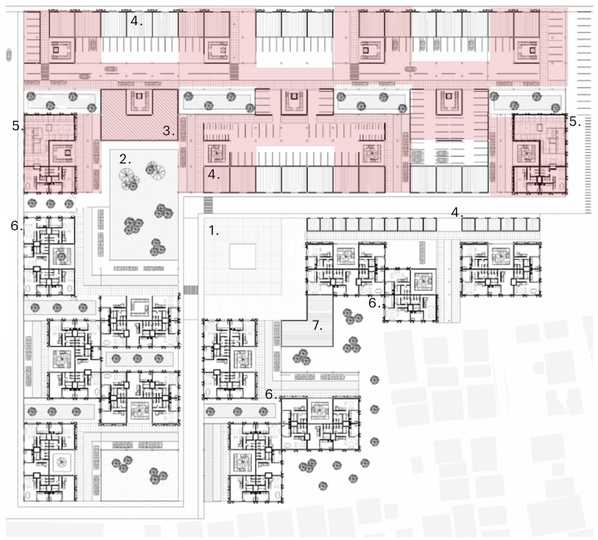


Design Results
Evening use of the roof



Design Results

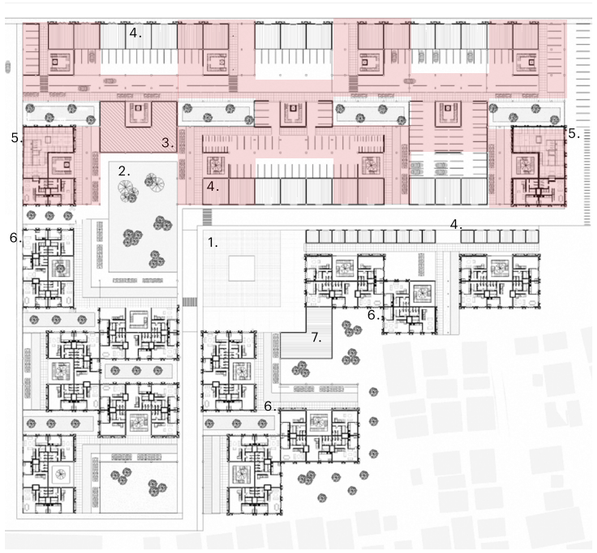
Cluster 2 on First floor

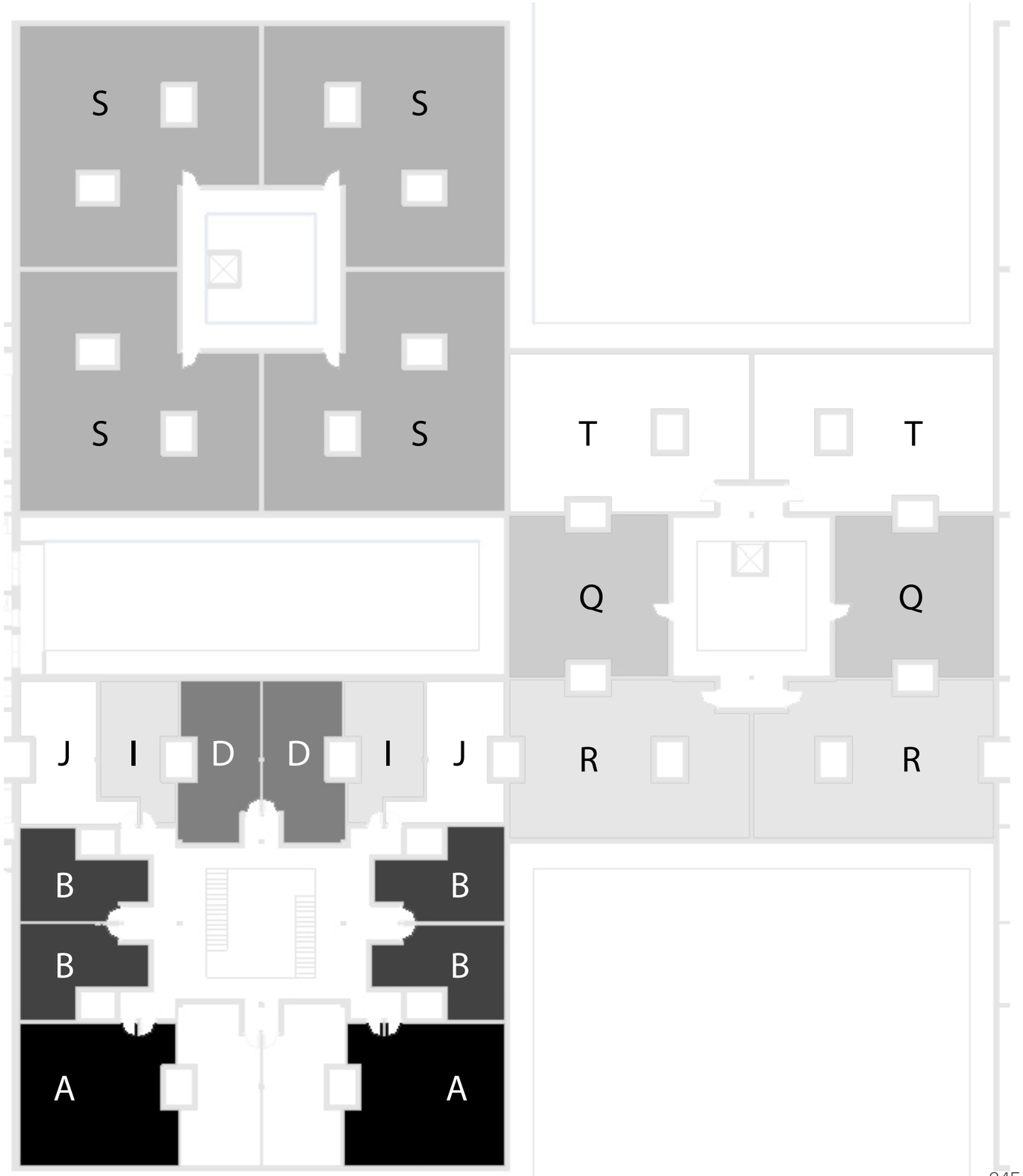




Design Results

Cluster 2 on second floor and over

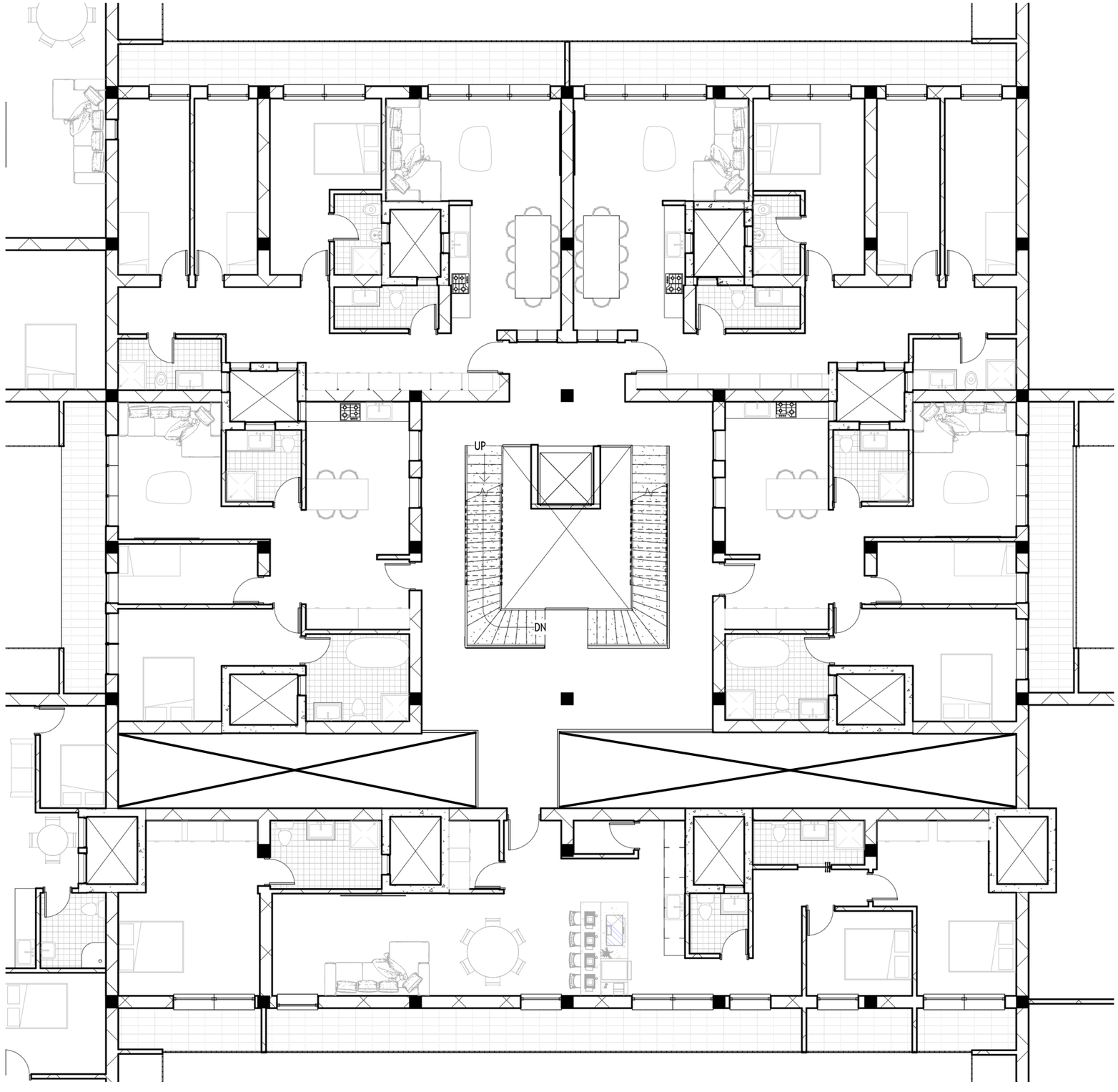




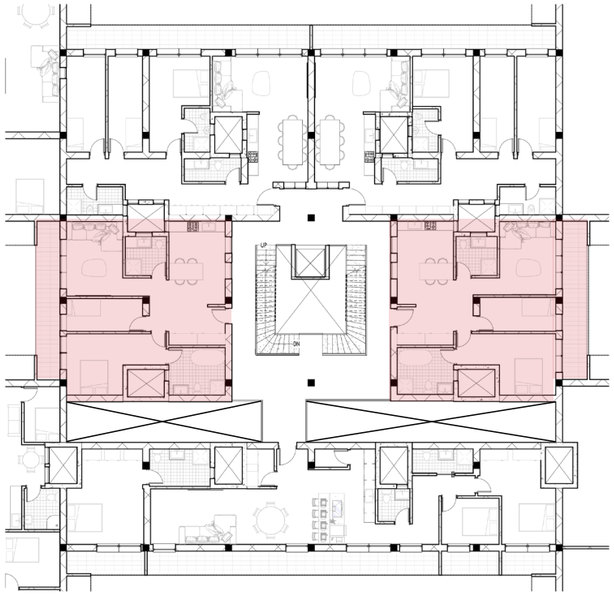
Design Results

Middle Income Typical Building layout - First Floor

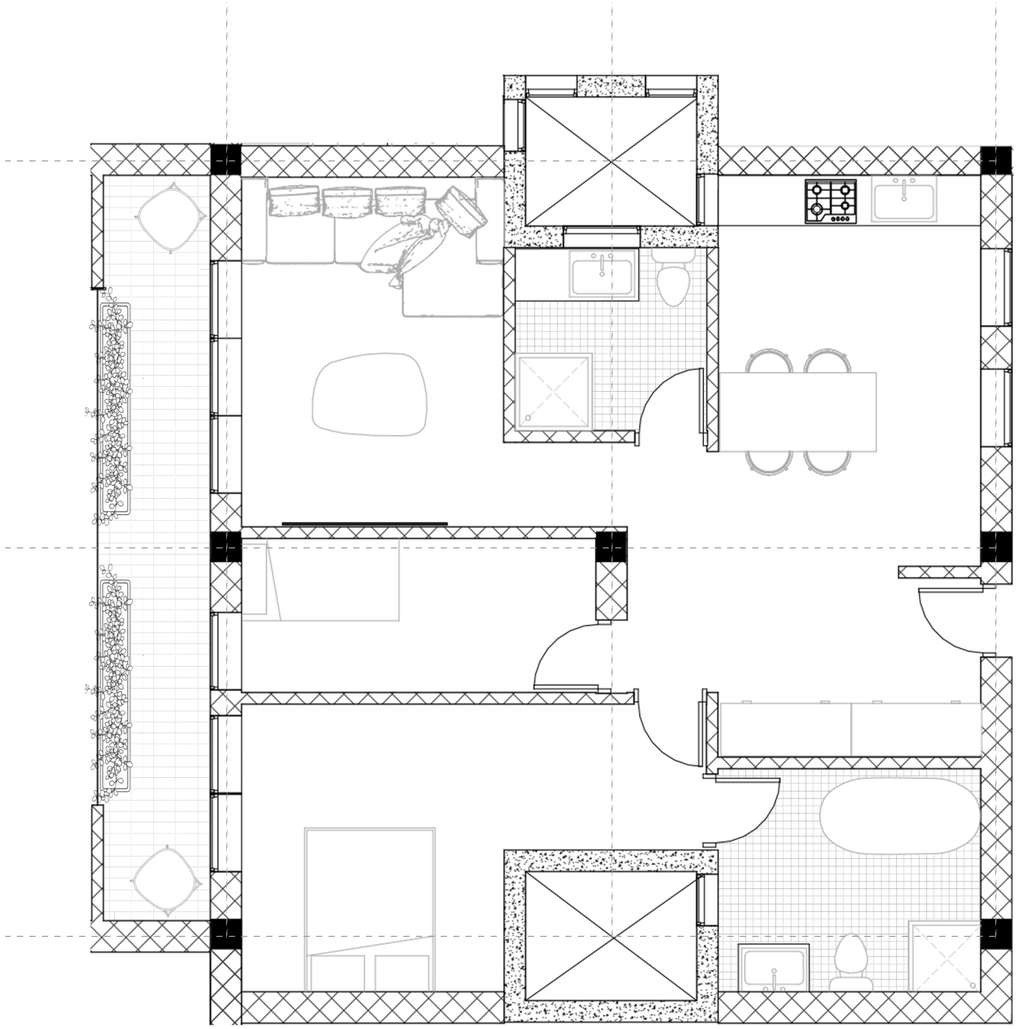




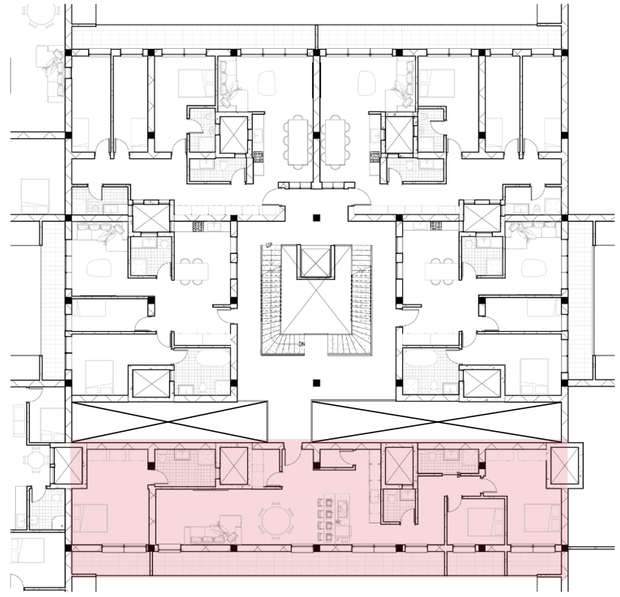
Design Results
Middle income dwellings



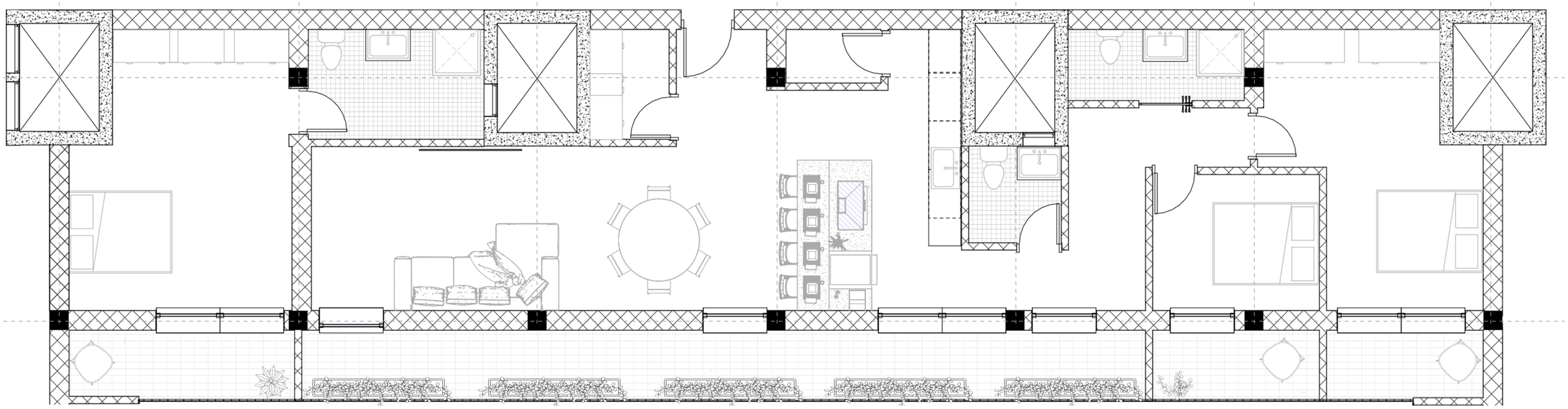
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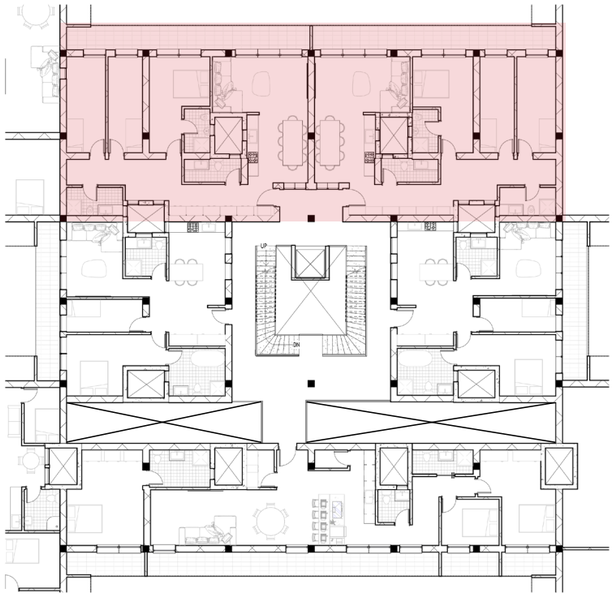
Design Results
High income dwellings



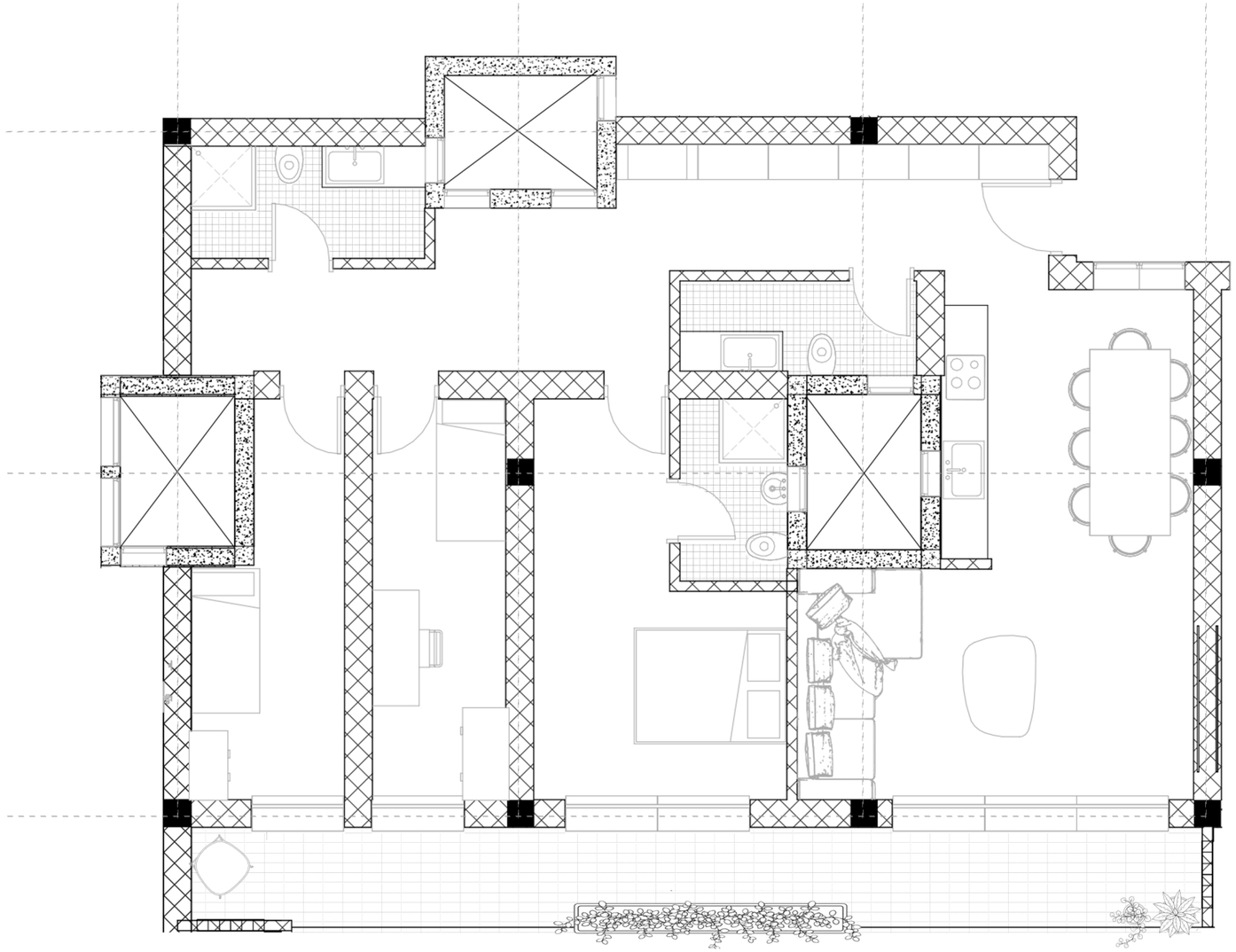
Type V1



Design Results
Middle income dwellings

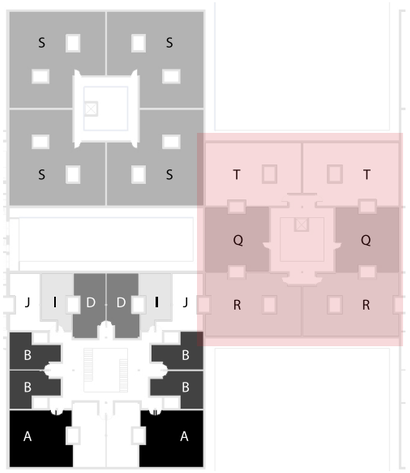


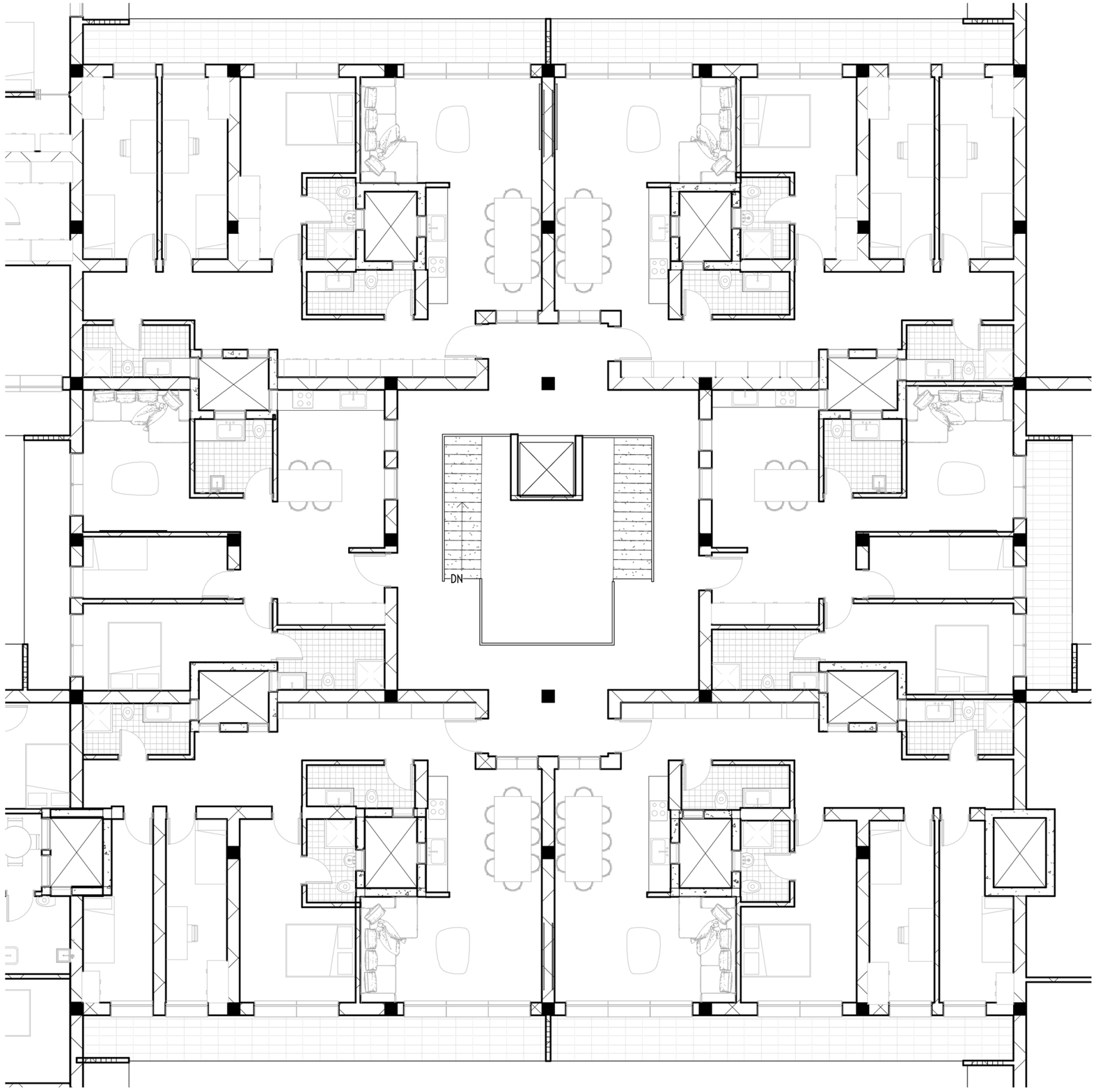
Type R



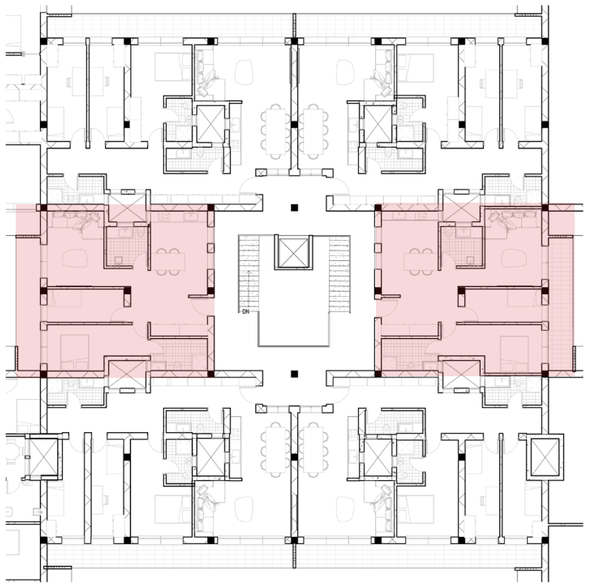
Design Results

Middle income Typical Building layout

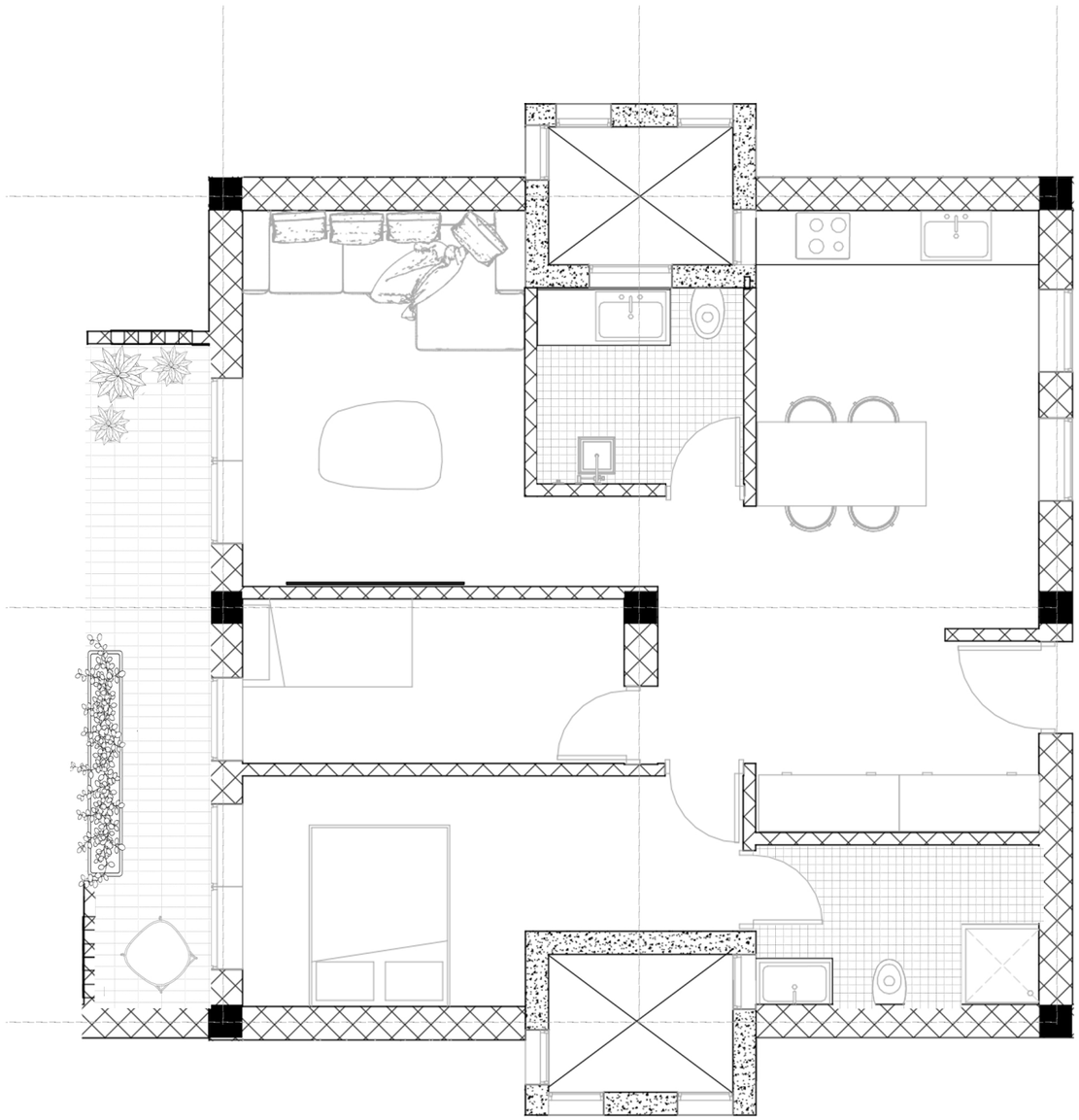




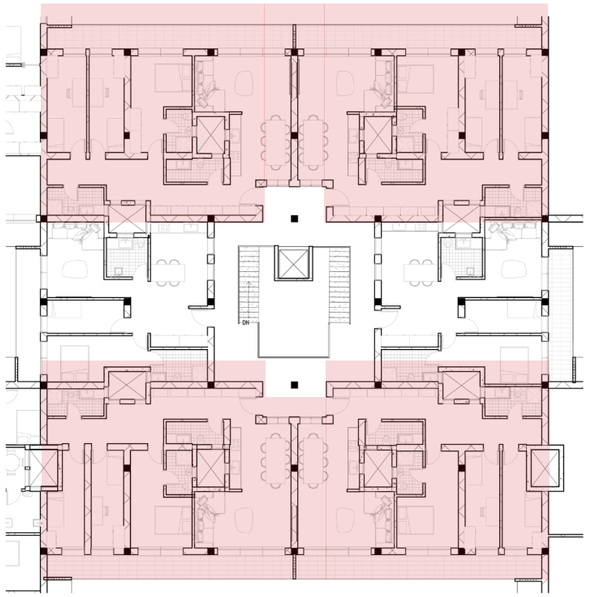
Design Results
Middle income dwellings



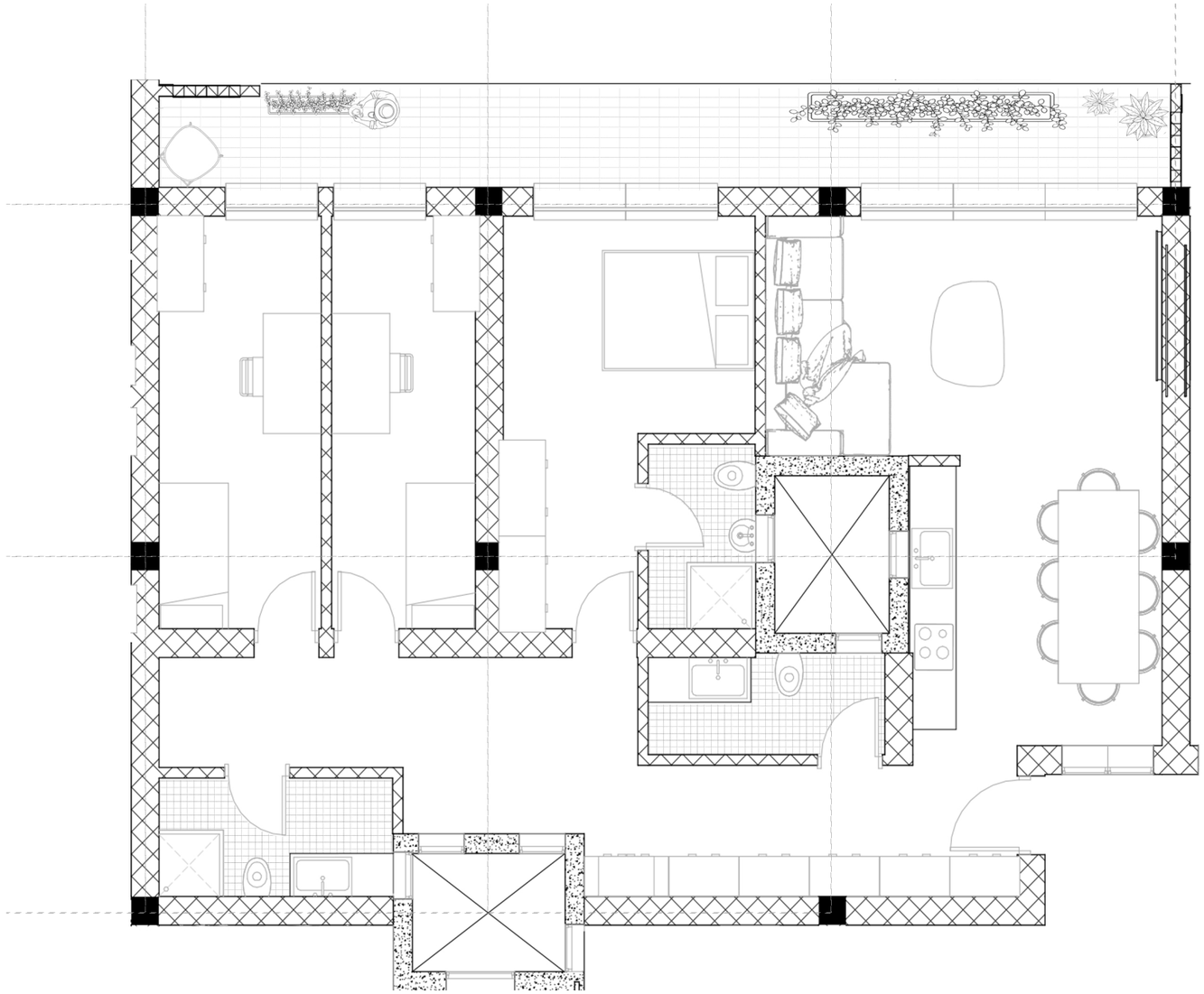
Type Q
77 sqm



Design Results
Middle income dwellings



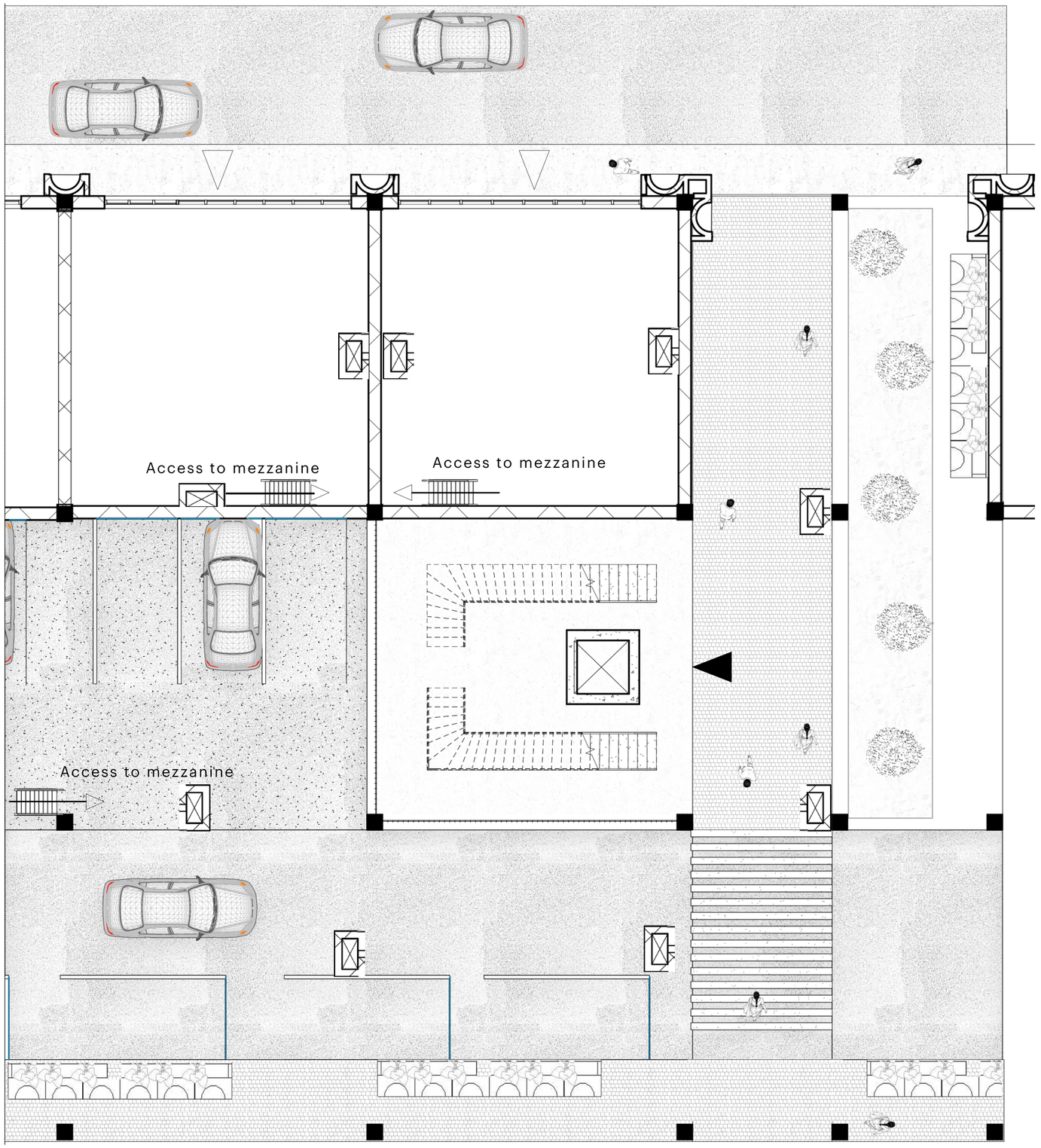
Type T



Design Results

High and middle Income typical ground floor layout

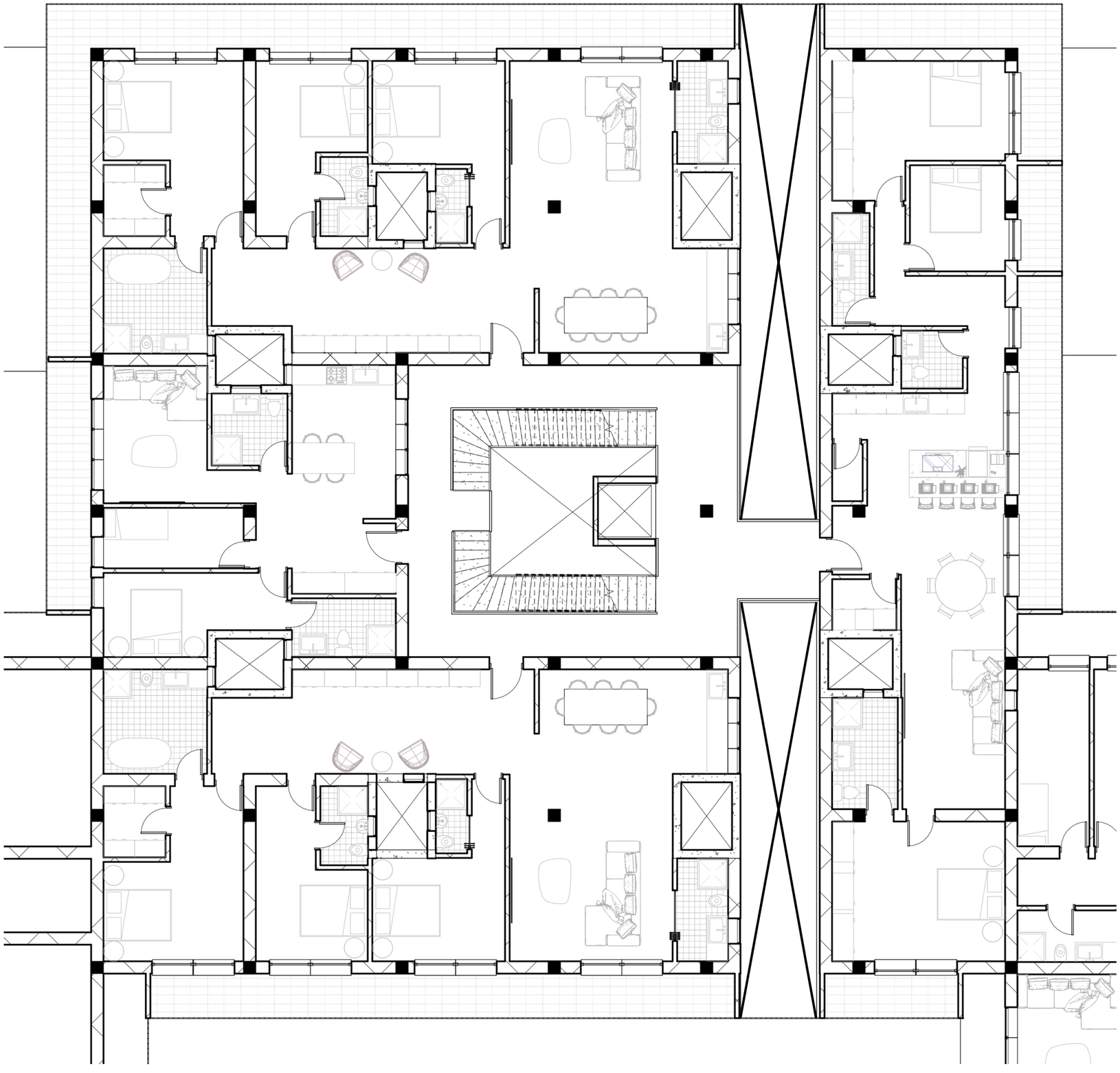




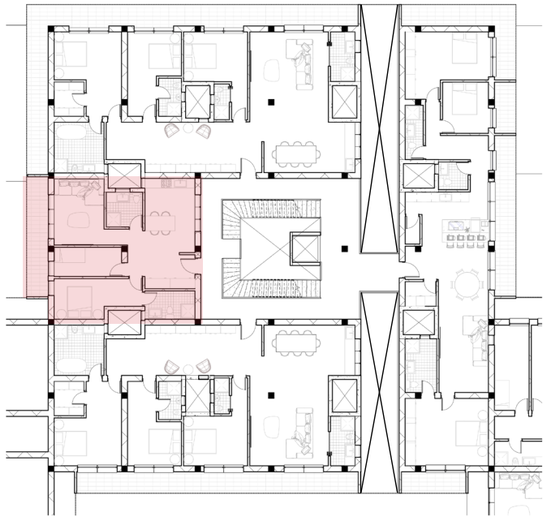
Design Results

High income Typical Building layout - First floor

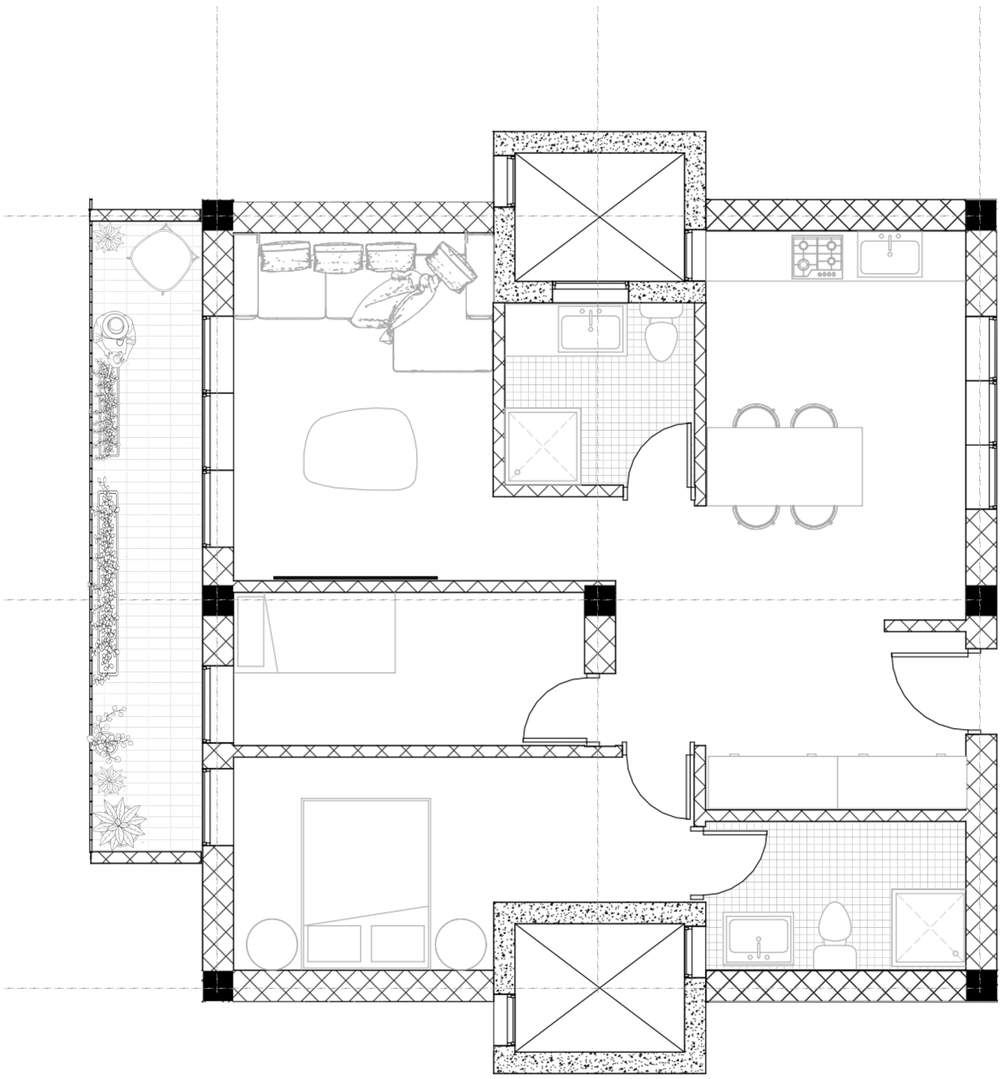




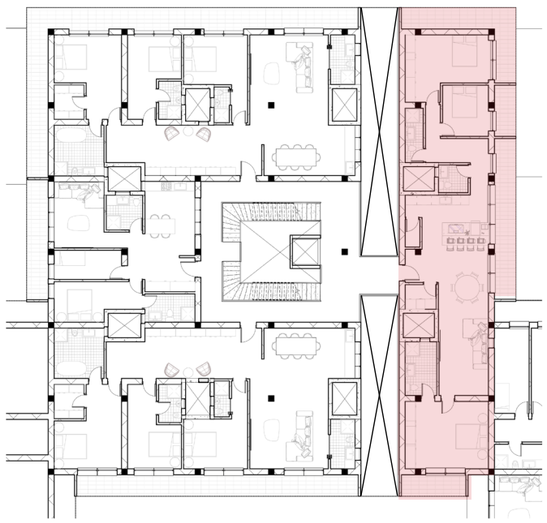
Design Results
Middle income dwellings



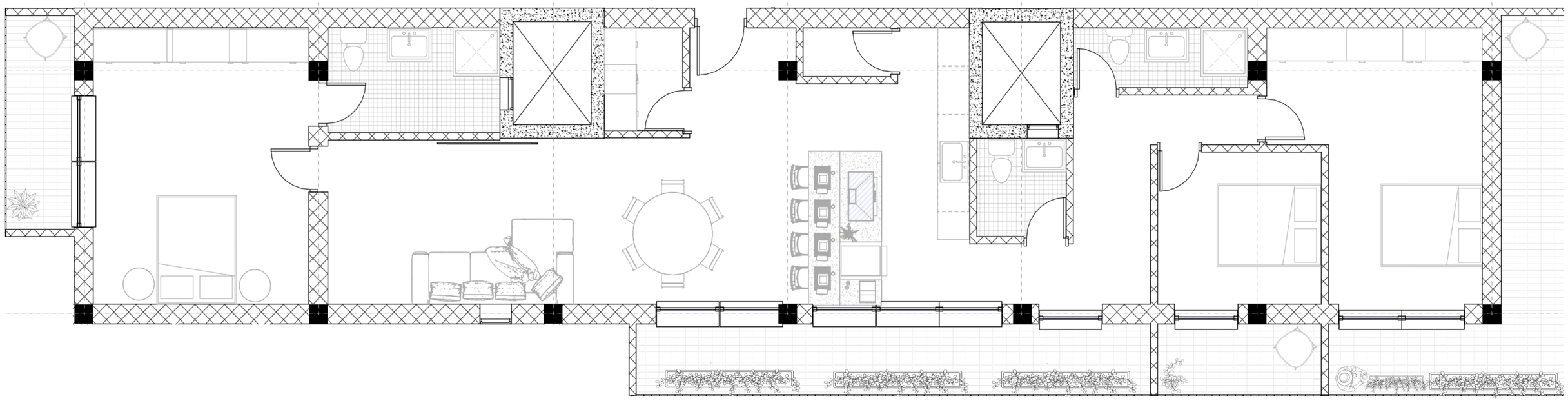
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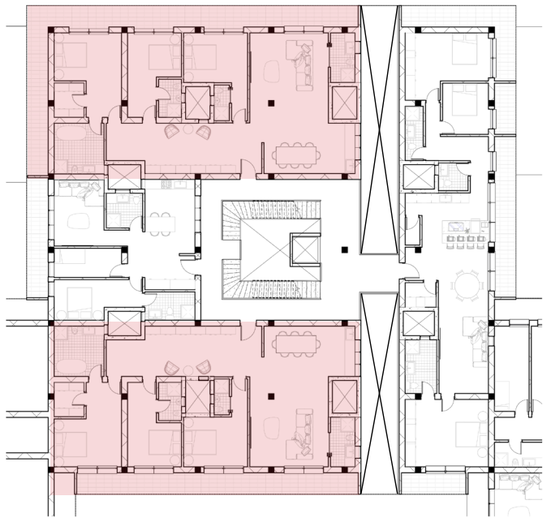
Design Results
High income dwellings



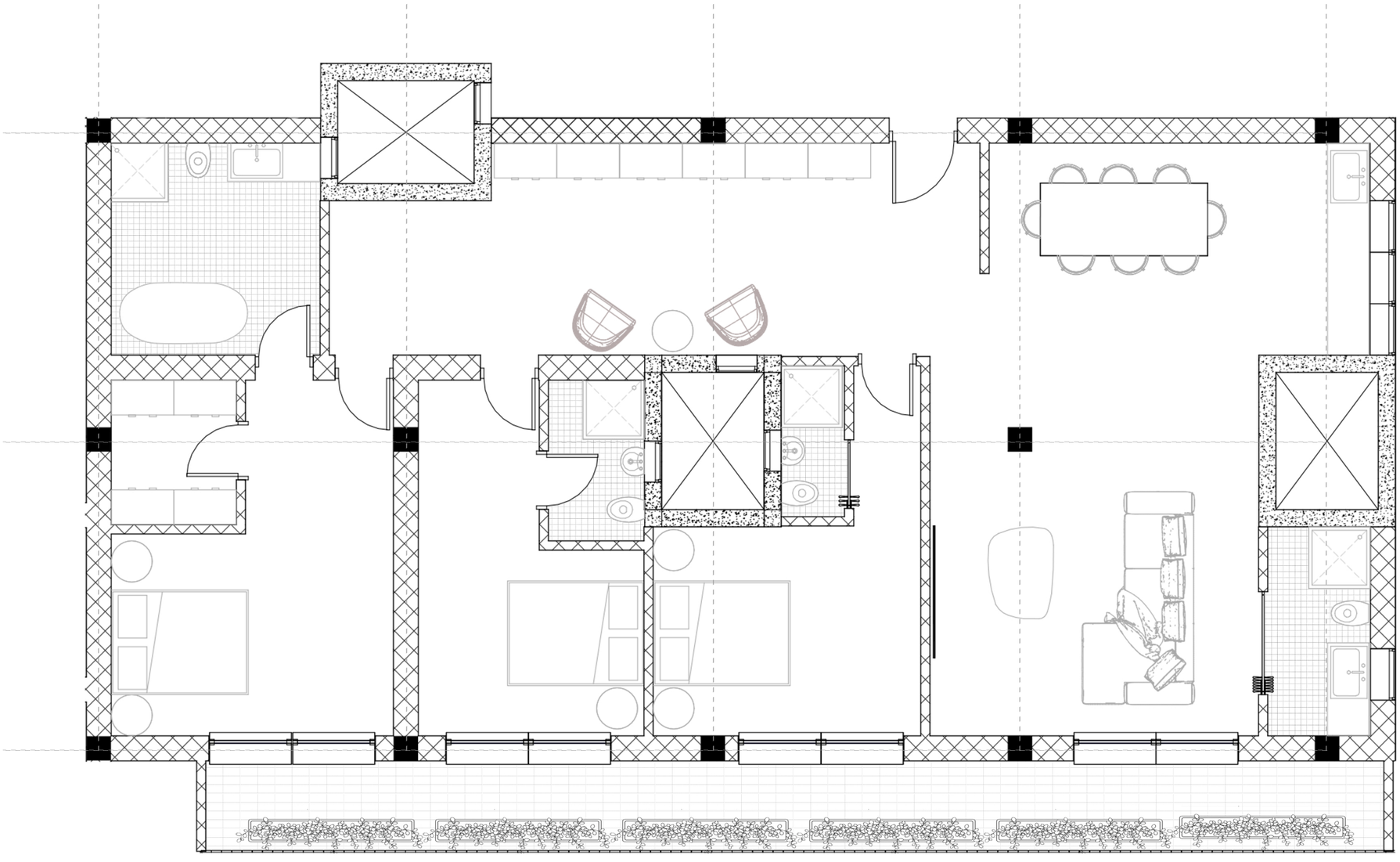
Type V2



Design Results
High income dwellings

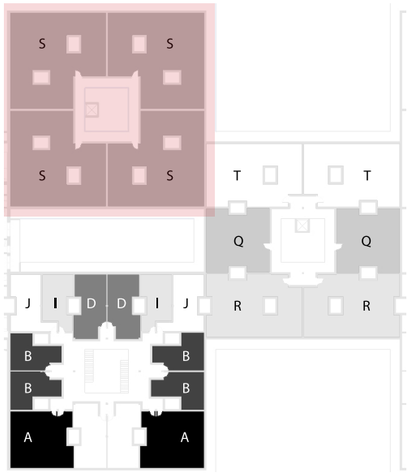


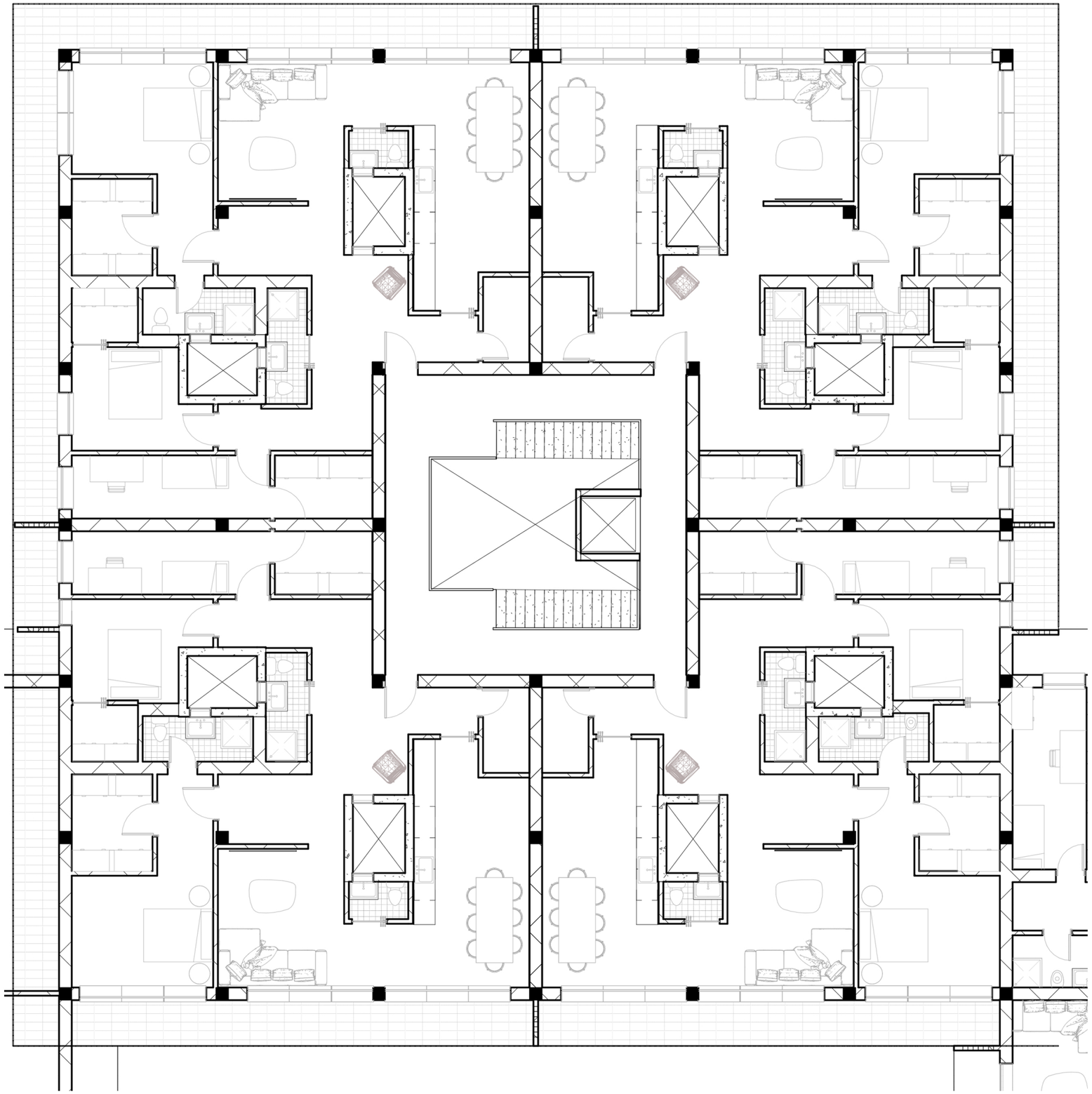
Type W



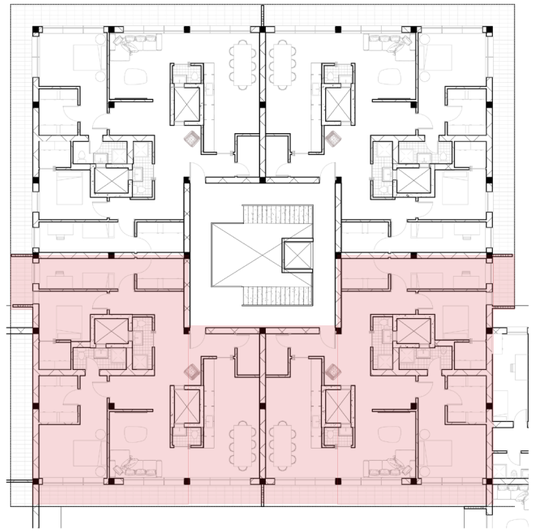
Design Results

High income Typical Building layout - + Second floor

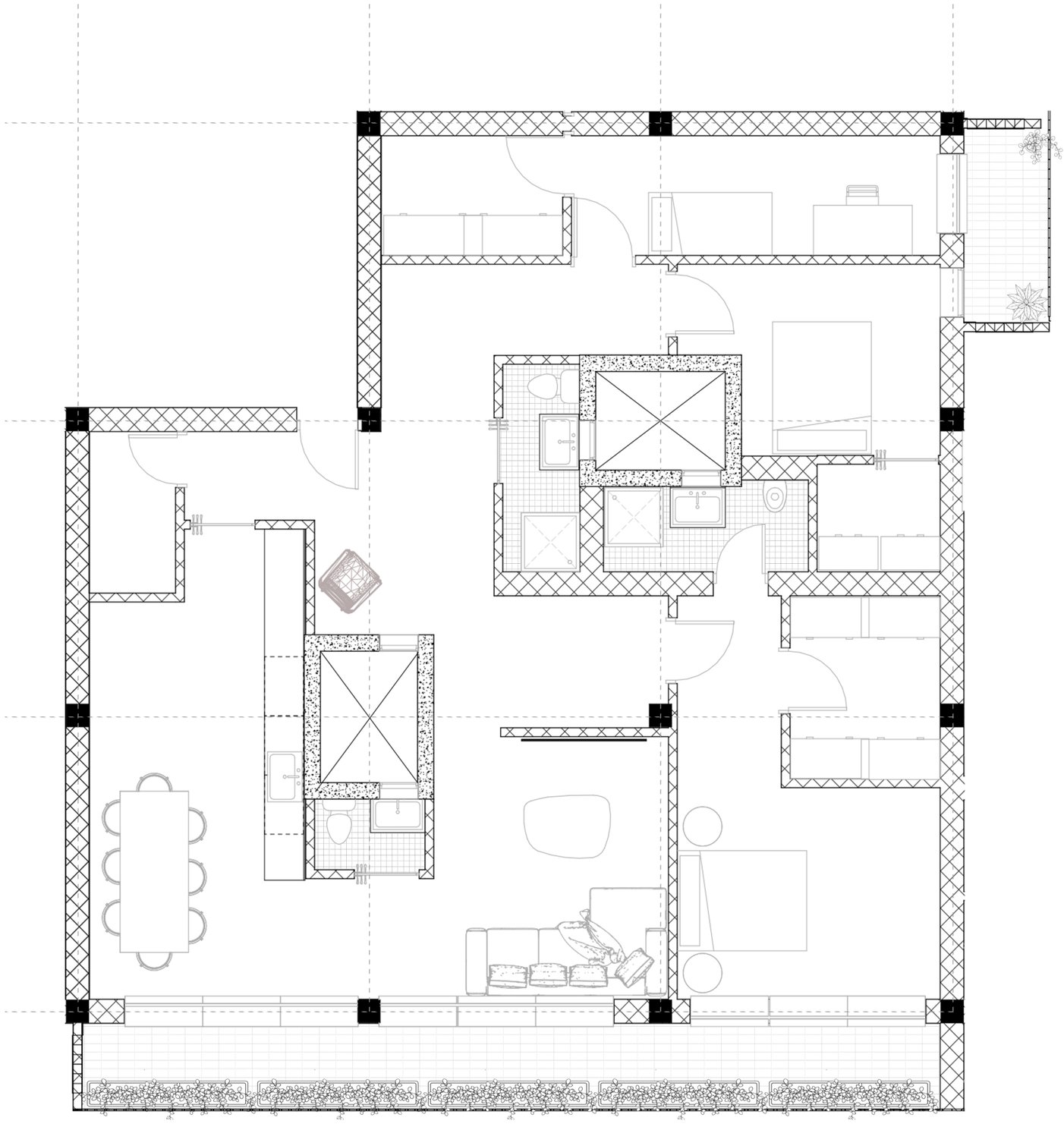




Design Results
High income dwellings



Type S

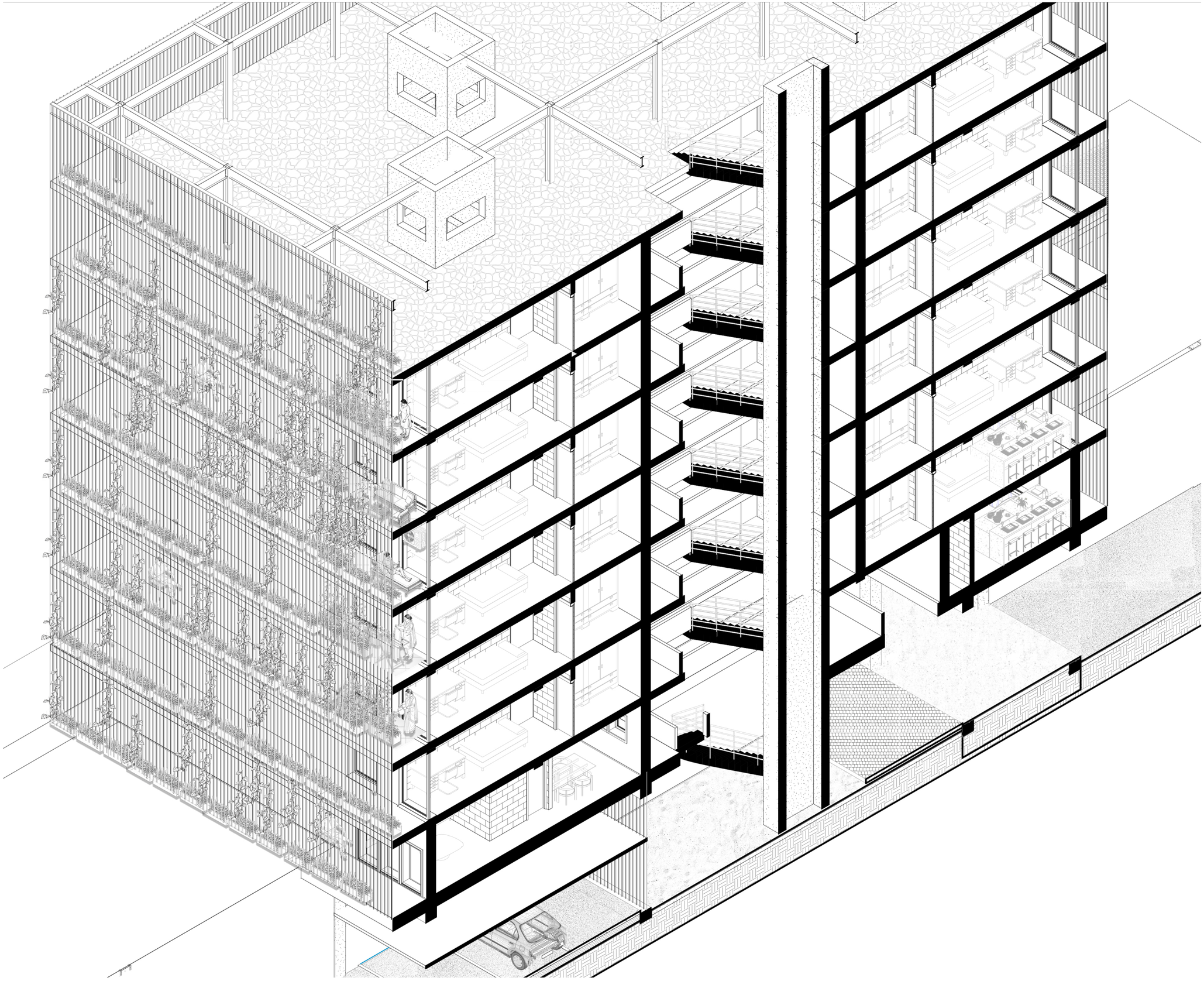


Design Results

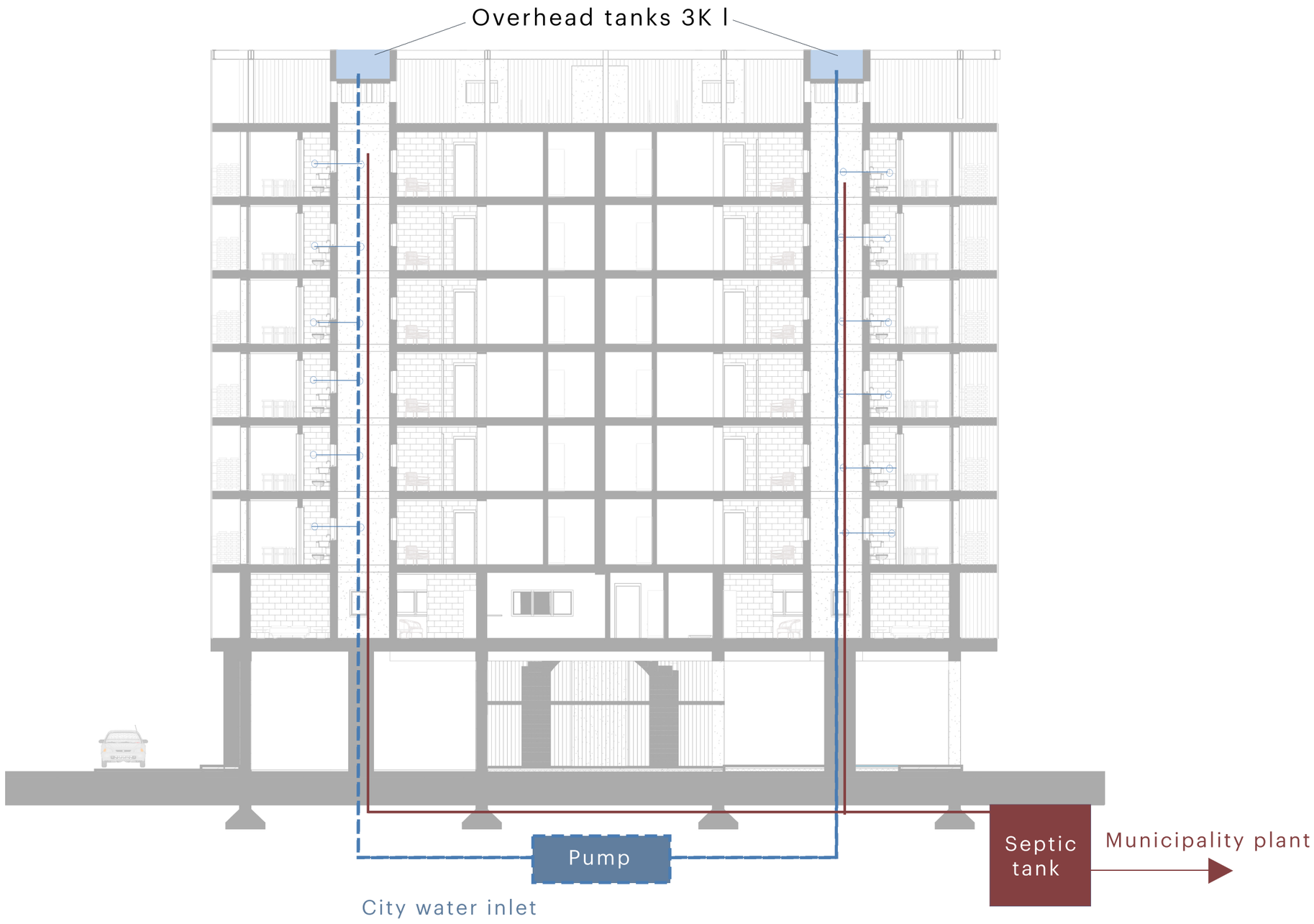
The facades of the middle and high income buildings feature a built in slab plant pot that surrounds the building. This creates an open view to the outside. The lack of a bannister help maintain a full view, without limiting the space, creating a sense of a larger area.

The facade here respects the same structure as the one from the social and low income buildings.

On top of parking areas, storage spaces are created. The height of the area is 5 m, therefore a parking and a mezzanine can fit properly. These storage spaces are meant for the social or low income people.

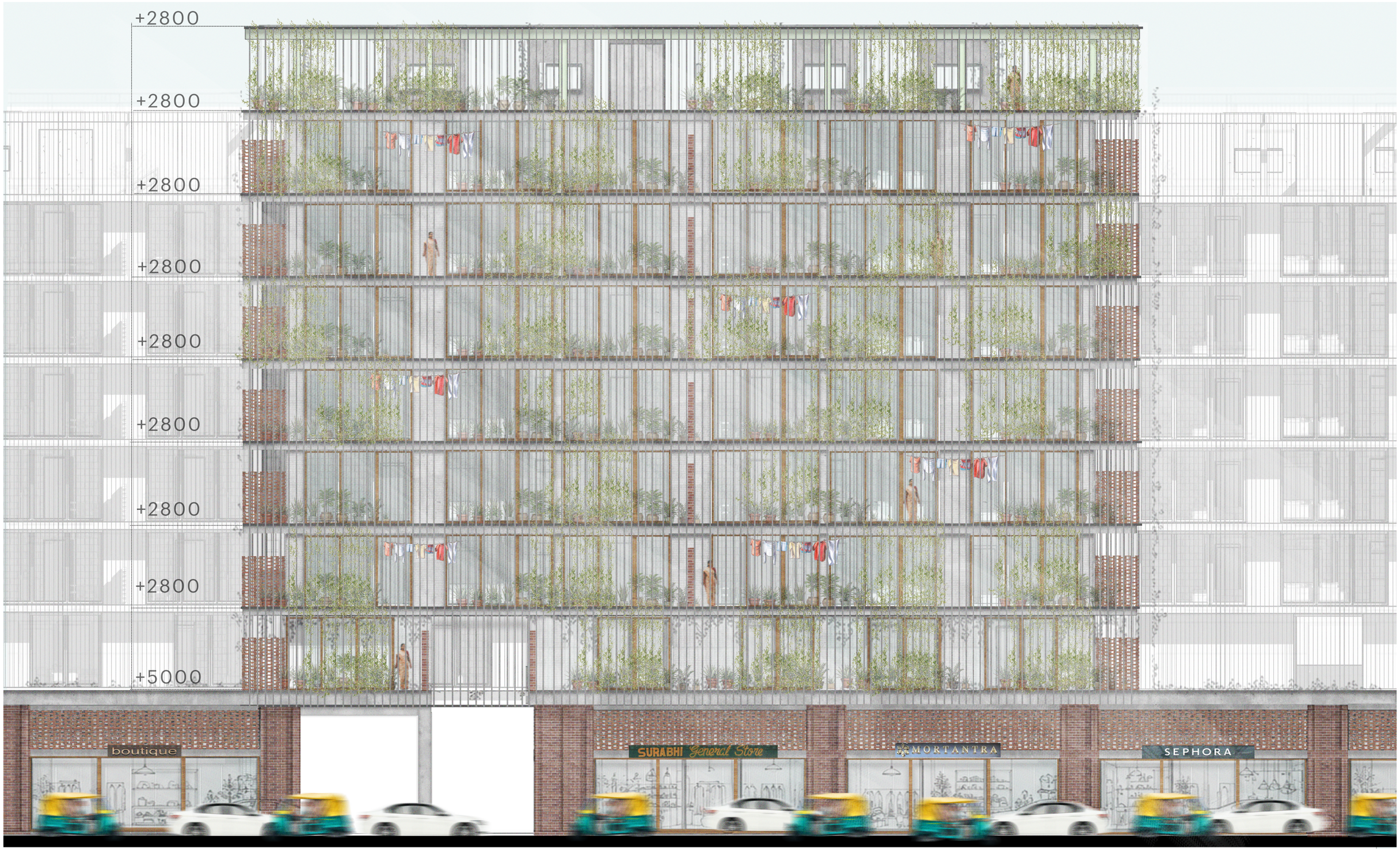


Design Results
Water management



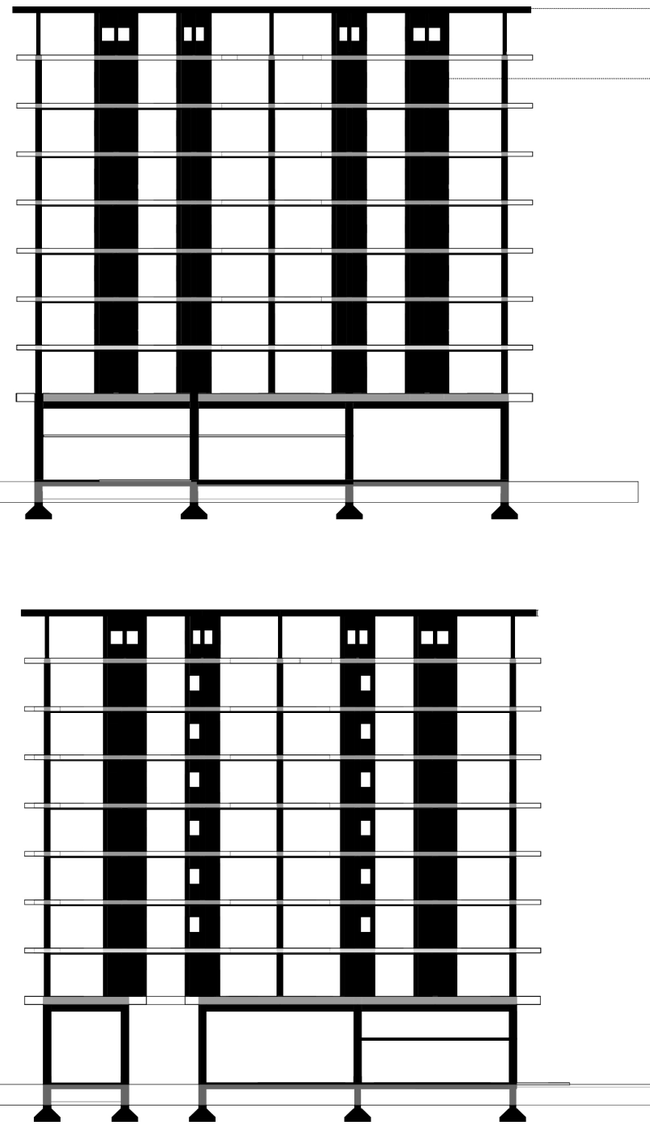
Design Results

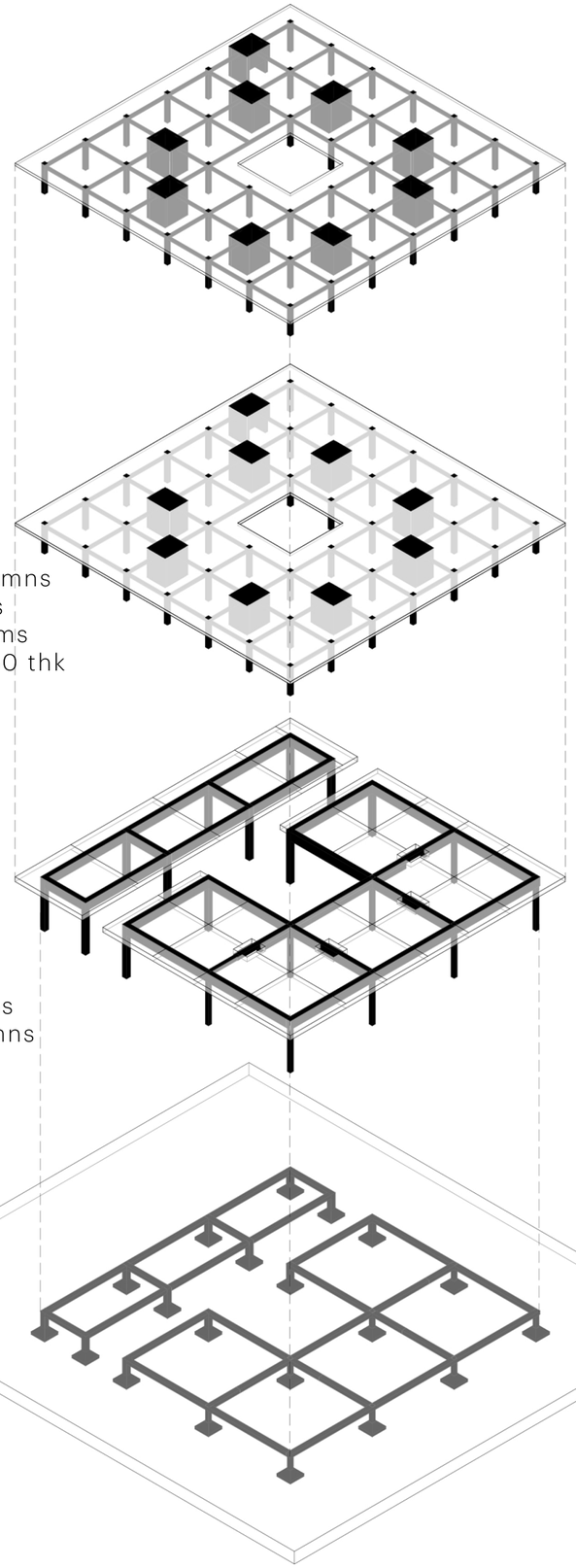
Elevation of shopping street and HIG building



Design Results

Structural diagram





Pergola 360Wx32.9 steel beams
203x203 steel columns

Concrete cores

Roof

345x345 concrete columns
250 mm concrete slabs
345x550 concrete beams
Concrete cores 250x250 thk

Second +Floor

First Floor

350 mm concrete slabs
450x900 concrete beams
450x450 concrete columns

Ground Floor

450x350 beams
450x450 columns
sloped concrete footing
2.5 m deep, 1500x1500

Part 4
Conclusion

Conclusion

This thesis aimed to answer the question: How can **high-density** housing adapt to the changing lives of **migrant workers** while supporting **social connections, livelihoods, and a sense of dignity**?

Analyzing the migrant housing situations in Ahmedabad, inadequate resettlement schemes, the theory of adaptability and participation, and examples of spatial arrangements like the Aranya Housing Scheme, the research found that the central problem of high-density housing does not stem from the high level of density, but from implementing density in a rigid and alienating manner.

The research found the notion that migrant workers represent a single, homogenous group of people to be highly misleading. Instead, the research argues there is a wide spectrum of migrant populations that are characterized by varying temporal statuses, including, but not limited to, long-term settlers, seasonal workers, and circular migrants. The migrant housing schemes offered by BSUP, for example, are located in Vatva and are designed to accommodate the dispersed, long-term circular migrants. These schemes are ultimately unsuccessful, because they impose rigid and permanent housing solutions on populations that are fluid and economically unstable (Salmi, 2019; Roychowdhury, 2014). The research also found that many of these schemes are designed in such a way that they move migrants away from and out of contact with employment and economic opportunities, informal economies, and the social networks and community structures that support migrant populations (Mahadevia et al., 2014).

Accordingly, the final design proposal reinterprets high-density housing not as an isolated architectural element, but as a multi-scalar adaptive urban ecosystem. Within the dwelling, building, cluster, and urban masterplan scales, the design attempts to integrate the concepts of adaptability, socio-economic interweaving, participatory design, and climate interactivity into a single interconnected spatial framework.

With the dwelling scale, the Seed Unit strategy interprets housing not as a finished product, but as separating permanent infrastructure from adaptable infill. Influenced by the works of Turner (1976) and Habraken (1961), the strategy gives purpose to residents and, importantly, transforms them into "spatial producers". The incremental framework offers a solution to the changing temporal and household compositions of migrant populations, whilst increasing affordability and potential for long-term ownership.

With the building scale, the proposal disregards the isolated tower typology of social housing. Instead, focus is placed on environmental and social performance. Tunnel openings, cores, and greening of the building's facade simultaneously act as social elements and climate devices, ultimately improving the building's passive cooling and permeability, and positively influencing social interaction.

With the cluster scale, the project addresses the disintegration and social isolation associated with repetitive standalone blocks. The mat-building strategy proposal, coupled with the hierarchical structuring of circulation systems, courtyards, and shared areas, integrates a hard/soft edge, bridging the gap of private and collective living. The proposal seeks to reinforce neighborhood connections, and recreate informal social conditions, which are often lost in vertical resettlement housing.

Finally, at the urban scale, the proposal seeks to combat socio-economic segregation by implementing a spatial hierarchy of mixed-income communities inspired by Balkrishna Doshi's Aranya Housing Scheme. While other housing schemes segregate the various income groups behind walls of exclusion, all HIG, MIG, LIG, social housing, hostels, and night shelters are to be situated within one framework. Integrated circulation systems, urban infrastructure, and built services work towards the relocation of migrant communities within the city, rather than on the peripheries, and encourage interaction between the diverse community blocks, hostels, and shelters.

The commercial spine, along with a central Maidan, further promotes integration by situating work and leisure at the center of the development. This design strategy is based on the author's fieldwork in Rajiv Nagar, where informal economies, social spaces, children's play, and collective activities formed an important part of everyday life despite the difficult living conditions.

This thesis ultimately claims that the provision of adequate high-density housing for migrant workers is not possible through the use of standardized, isolated, and quantitative measures of density. It is housing, rather, that is layered, flexible, and socially and economically integrated. From this perspective, the measure of density is not something that is negative, like the measure of congestion, but is, rather, something that is positive, like the measure of connectivity.

The project is aimed at providing a model of migrant housing in Ahmedabad by prioritizing participation, permeability, environmental dignity and collective belonging, in an attempt to address the challenges of a migrant's life.

Reflection

This thesis began from the standpoint that urban migrants who build and sustain the city of Ahmedabad are often excluded from the formal urban spaces of the city. As the research progressed, it became clear that the challenges of migrant housing are not limited to the provision of housing, but include the critical components of dignity, social inclusion, economic affordability, and the right to engage in and shape the city.

High-density housing is not a problem in itself. One of the most significant conclusions of this research is that the problematic outcome of initiatives such as the BSUP resettlement colonies are the result of a restrictive and uniform application of the dense standard. The assumption that moving migrant groups to isolated tower blocks resolves the problem of housing focuses on the separation of the residents from their livelihood and community, along with their informal networks of support, and creates alienation instead of inclusion (Salmi, 2019; Roychowdhury, 2014). In that context, this research has redirected its focus from density as a problem to be solved within quantitative frameworks to density as a problem to be addressed in the context of social and spatial frameworks.

Fieldwork undertaken in Rajiv Nagar informed the focus of this research greatly. Documenting the everyday life of migrants highlighted the potential that many of the spatial practices of informal settlements hold in terms of being adaptable, socially interactive and economically resilient. The informal settlement was a housing and a social and economic integration system. Structures such as outdoor cooking and trading, gathering spaces, self-built and adapted spaces, and other informal structures indicate that residents continuously adapt their environment.

The design approach shifting meant that instead of trying to eliminate informal aspects with overly formal and rigid structures, the project would work within high-density frameworks and adopt the positive aspects of informal settlements. Formal settlements would incorporate informal settlements positively. Because of this, the focus shifted from designing external objects to design settlements, to creating the conditions within the settlement so that people could adapt the settlement, and so that it could be expanded and develop participatively over time.

A key consideration regarding the role of the architect revealed that, within formally researched and constructed frameworks, the fields of migration, labor, and the informal economy and access to housing would remain. Within this context, the role of architecture was to create systems within which people would be able to inhabit formally, while structures of rigid and permanent housing would gradually transform into a flexible housing unit.

The ideas of and Turner's and Habraken's were very important and challenged the way social housing was approached. The Seed Unit strategy was based on the belief that dignity could be attained from the ability to control and change the environment in which the social unit was housed, and could be attained from a unit that was participatively and adaptively built.

The project also highlighted the importance of the balance between adaptability and architectural coherence. A settlement, would allow for modification by the residents and would support the idea of flexibility, growth, and incremental development of the settlement. In reality, this could be achieved only if a community was organized and active, and if the required supportive policies and a good disposition for management were available.

The study also focused on environmental comfort in relation to housing dignity. In the case of Ahmedabad, improvement of the quality of life is associated with addressing the environmental comfort of ventilation, shading, access to water, and thermal comfort. In this context, tunnel voids, stepped roofs, green façades, and shaded community spaces become social interventions in addition to being environmental ones.

Lastly, this thesis advocates for a fusion approach as opposed to a fragmented approach. Though migrant workers are regarded as a temporary workforce, they are crucial to the development of the city. The fragmented housing approach is countered by a fused approach that integrates migrant families into the city through providing a mixed income housing system, public transport, community infrastructure, and organised economic activity.

This thesis advocates that housing should be understood not as an end product that is delivered to the users, but as a resource that continues to evolve in response to the needs of the residents. Consequently, this position enables architecture to opt for a flexible approach as opposed to instrumentalisation of architecture for the purpose of participation, negotiation, and fostering a sense of ownership of the city

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Appendix

DATA MANAGEMENT CHECKLIST

Instruction

This checklist is relevant for all graduation projects of the Master AUBS. The form is intended to highlight common aspects of graduation projects that require particular attention with regard to planning the research and data management. Relevant information and supplementary sources regarding each question are provided below each question.

With this checklist, the faculty wants to avoid that students unexpectedly find themselves in complex and stressful situations, in which ethical or privacy matters and/or other laws and regulations become an issue. In projects involving humans, certain types of data processing increase the risks to the human participants: planning such projects requires additional evaluations and advice from university staff before ethical approval can be received and the project can begin. In the case of a graduation project, obtaining additional advice or permits may delay the project with an extra education period or semester. To avoid this, it is recommended that students set up a graduation project with a low level of risk. Therefore, all students have to check their risk, by completing this checklist before their A1.

The first section of the checklist (A) should be completed by all students, together with their supervisor, during the planning of the graduation project, before the A1. It does not need to be submitted to anyone for review or approval. Please consider questions 1 to 3 carefully in relation to the intended graduation project, and answer with 'yes' or 'no'.

The second section of the checklist (B) should only be completed if the graduation project involves working with data from human participants. In that case, the student and their supervisor must apply for and receive ethical approval from the Human Research Ethics Committee (HREC) before the project can begin (see the paragraph 'Explanation and follow-up' after the questions). The student can submit the application to the HREC, but the supervisor is responsible for making sure that the project is compliant with relevant privacy regulations and ethical policies.

Section A. General considerations	yes	no
1. Is the graduation project conducted as part of an internship (at a company), or as part of a research project at TU Delft? If a student's graduation project is conducted at a company or as part of a research project at the university, questions of data ownership and intellectual property rights need to be addressed in a written graduation or internship agreement before the project begins. Students and their supervisor should consult the Intellectual Property Rights of Students webpage. Additional information can also be found in the Extended Personal Research Data Workflow.		✓
2. Does the project involve conducting (part of) the research outside the Netherlands? Students who intend to travel abroad (even to other EU countries) for study, exchange, research, internship, or graduation project purposes need to follow the Travel Safety Protocol. This includes attending a mandatory Travel Safety Training Session: see the Disclaimer.	✓	
3. Will the research involve processing data from humans, such as running a survey, conducting interviews or workshops, collecting data through social media or internet forums, or re-using existing datasets about humans provided by a third party? (If 'yes', see follow-up questions 4 to 13 in Checklist B.) Students who work with data from human participants must complete the next section and apply for and receive ethical approval from the Human Research Ethics Committee (HREC) before conducting the research.		✓

Section B. Extended risk factors (only if question 3 has been answered with 'yes'.)	yes	no
4. Will the project involve participants who may be considered vulnerable, such as the elderly, refugees or asylum seekers, ethnic minorities, patients, or people with disabilities? Participants who may suffer very adverse consequences (for instance, due to discrimination) if their personal data became publicly available can be considered vulnerable.		✓
5. Will the project involve participants who cannot themselves give informed consent for taking part in the project, but for whom consent must be obtained from a legal guardian? Participants who cannot give informed consent can include, for instance, children or participants with intellectual disabilities, mental disorders, or dementia. Such participants are also considered vulnerable in the context of the General Data Protection Regulation (GDPR).		✓
6. Will the project involve processing any of the special categories of personal data below? - Race - Ethnicity - Criminal offence data - Political opinion - Union membership - Religious or philosophical beliefs - Sex life and/or sexual orientation - Health data (including measurements such as heart rate) - Biometric or genetic data (including fingerprints, iris scanning, facial recognition) The General Data Protection Regulation (GDPR) defines a stricter rules for processing special categories of personal data. If it is necessary to process these data in a project, it is it is important to provide additional safeguards.		✓
7. Will the project involve processing personal data that could be considered sensitive, such as the ones listed below? - Information about a person's income, debts, or other payments - Information about a person's (un-)employment status - Information about a person's performance at school or work - Information about relationship problems or (gambling) addiction - Information about poverty, domestic violence, or youth welfare/social work involvement Some types of personal data are considered sensitive, because they can have a high impact on the privacy of the data subject if other persons gain access to these data. Sensitive personal data should only be processed if necessary: in such cases, additional safeguards need to be put in place.		✓
8. Will the project involve processing video-recordings, or photographs of participants? TU Delft considers photographic and video-materials of research participants to be sensitive personal data. If such data need to be processed, additional safeguards must be put in place.		✓

Section B. Extended risk factors (only if question 3 has been answered with 'yes'.)	yes	no
9. Will the project involve sharing or transferring personal data between multiple partners or collaborating organisations involved, such as between TU Delft and an internship company? According to privacy law, sharing personal data between organisations requires a privacy agreement to be in place: setting this up takes time, and requires support from additional university staff. Furthermore, personal data sharing can potentially expose research participants to different types of risks: these risks must be considered in the ethical application.		✓
10. Will the project involve deception, or covert observation of participants? In some types of research, obtaining informed consent for processing participants' personal data is not an option: for instance, if the research involves deception, or the research is covert (conducted without participants knowing about it). In such situations, the steps to mitigate risks to participants are important, and an alternative legal basis for processing the participant's data needs to be established with the help of additional support staff.		✓
11. Will the project involve working with social media data? Social media data are personal data, but since it is usually not possible to ask for informed consent for processing social media data, another legal basis for processing the participant's data needs to be established. Processing of social media data also involves legal considerations related to terms of use of data from third-party platforms: therefore, research with social media data requires expert support on privacy, ethics, and legal matters.		✓
12. Will the project involve using learning algorithms or other AI to analyse, combine, or otherwise process data from participants? The use of AI in research involves many considerations in terms of data protection, ethics, security, and intellectual property: for more information, see TU Delft's Instructions for use of Generative AI.		✓
13. Will the project involve participants who are based in a country or countries outside of the EU? Students affiliated with TU Delft must comply with Dutch and EU regulations of personal data processing (GDPR). Furthermore, the student and their supervisor must make sure that the research complies with local (privacy) legislations of any foreign destinations. Additional support from an external (local) expert may be required.		✓

Explanation and follow-up

If you have answered 'no' to all questions 4 to 13, your project is likely to be considered low or minimal-risk: see the paragraph 'Projects with minimal or low-risk' on the next page.

If you have answered 'yes' to one or more of the questions 4 to 13, your research likely involves extended or high risks to participants, according to the General Data Protection Regulation (GDPR) and TU Delft's privacy and ethical policies: for information regarding such projects, see the paragraph 'Projects with extended or high-risk' on the next pages.

Projects with minimal or low-risk

If you have answered 'no' to questions 4 to 13, your project is likely to be considered low-risk. This does not mean that the project involves no risks at all, but suggests that these risks can likely be addressed by the student and supervisor in the application to the Human Research Ethics Committee (HREC) within the timeline for a graduation project and without need for additional support.

Compiling the HREC application:
An application to the HREC generally involves a Data Management Plan (DMP), a risk-identification and mitigation checklist, and informed consent materials. Master's students at ABE who intend to compile a HREC application are advised to make use of the following support documents:

- the student guide
- the Example Data Management Plan for MSc projects

The graduation supervisor is responsible for the student's project and ethical application, and must provide support for compiling the HREC application documents.

Additional support
For low-risk student graduation projects, compiling of the HREC application documents should be done by the student in consultation with the supervisor. The Faculty Data Steward can be contacted for individual questions at datasteward-BK@tudelft.nl: however, the Data Steward does not provide detailed feedback on student DMPs for low-risk HREC applications.

Additional resources
The HREC has guides available for completing the checklist and for compiling informed consent materials. Additionally, the Guide to the Extended Personal Research Data Workflow has been created to help researchers and students who work with human participants comply with both GDPR principles and TU Delft's policies on Data Management and Human Research Ethics.

Timeline
Minimal or low-risk HREC applications are generally processed faster than extended or high-risk applications (see the paragraph below). Nevertheless, the initial evaluation by the HREC usually takes approximately 2 weeks, and may take longer during busy periods or holiday: see the HREC website for up-to-date information. Additionally, the application may require revisions before final approval is granted. If you do not receive an initial response about your ethical application after 4 weeks from the time of submission, you may follow up with the HREC to enquire about an update.

Projects with extended or high-risk

If you have answered 'yes' to one or more of questions 4 to 13, there are potential increased risks related to how data from human participants will be processed in your project. These risks will need to be addressed in consultation with the Data Steward and other relevant support staff before submitting the ethical application to the Human Research Ethics Committee (HREC).

Compiling the HREC application
An application to the HREC generally involves a Data Management Plan (DMP), a risk-identification and mitigation checklist, and informed consent materials. Master's students at ABE who intend to compile a HREC application are advised to make use of the following support documents:

- the Ethical Approval & Data Management Planning Student Information
- the Example Data Management Plan for MSc projects

The graduation supervisor is responsible for the student's project and ethical application, and must provide support for compiling the HREC application documents.

4

Additional support

Once the DMP has been compiled and reviewed by the supervisor, feedback should be requested from the Data Steward via DMPonline. After this, any other necessary support staff will need to be contacted. Crucially, if the project involves one or multiple ways of personal data processing that could result in high-risk to the participants according to the GDPR, the TU Delft Privacy Team must be consulted to establish whether or not a Data Protection Impact Assessment (DPIA) is required.

Additional resources

The HREC has guides available for completing the checklist and for compiling informed consent materials. Additionally, the Guide to the Extended Personal Research Data Workflow has been created to help researchers and students who work with human participants comply with both GDPR principles and TU Delft's policies on Data Management and Human Research Ethics.

Timeline

It can take a long time to compile a complete research plan and HREC application for projects involving extended risks. DMP feedback from the Data Steward usually takes around 2 weeks, but can take longer during busy periods or holidays. Receiving additional support from other staff, such as the Privacy Team, can take anywhere from a few days to multiple weeks, depending on the project and capacity of university staff. If a DPIA is deemed necessary, it can take anywhere from 4 weeks to several months.

It is important to note that advice from the Privacy Team or other support staff, as well as any additional documents (such as necessary contracts, or a DPIA, if needed) must be in place before the application is submitted to the HREC. The initial evaluation by the HREC can be processed in 2 weeks, but may take longer during busy periods or holidays: see the HREC website for up-to-date information. Additionally, the application may require revisions before final approval is granted. If you do not receive an initial response about your ethical application after 4 weeks from the time of submission, you may follow up with the HREC to enquire about an update.

Considering the limited time available for students conducting their graduation projects, students working with data from human participants are strongly advised to prioritise low-risk research projects. If a student project necessitates processing data in ways that are considered extended or high-risk, both student and supervisor need to be aware of the extended processing times involved in obtaining ethical approval and beginning the graduation project.

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